ADVERTISING PAGES REMOVED

The FOUNDRY

Contents

VOLUME 68

NUMBER 4

APRIL, 1940

	PAGE
Editorial	23
Rapid Delivery Is Pride of Jobbing Foundry *By Edwin Bremer*	24
A.F.A. Completing Plans for Greatest Convention	27
The Foundry Industry and Army Ordnance *By Col. Norman F. Ramsey*	28
Fundamentals of Cupola Practice *By Don J. Reese*	30
Avoiding Defects in the Nonferrous Foundry *By N. K. B. Patch*	33
New Foundry Builds Truck Engines *By Pat Dwyer*	34
Questions and Answers	38
Men of Industry	42
Foundry Developments at Short Range	46
The Adventures of Bill *By Pat Dwyer*	48
Wisconsin Holds Third Regional	52
Western Foundrymen Meet at Del Monte	63
Birmingham Stages Eighth Conference	64
Activities of Foundry Groups	72
Among Detroit Foundries *By A. H. Allen*	80
Obituary	86
Foundry Activities	106
Where-to-Buy Directory	109
Reviews of Manufacturers' Literature	113
Index to Advertisers	130

Editorial Staff

FRANK G. STEINEBACH
Editor

PAT DWYER
Engineering Editor

EDWIN BREMER
Metallurgical Editor

DON S. CADOT
Art Editor

New York . . . B. K. PRICE, L. E. BROWNE, I. H. SUCH
Chicago . . . . J. F. POWELL
Detroit . . . . A. H. ALLEN
Pittsburgh . . . . R. L. HARTFORD
Washington . . . L. M. LAMM
London . . . VINCENT DELPORT

Advisory Staff

JOHN W. BOLTON
ALBERT E. GROVER
JOHN HOWE HALL
N. K. B. PATCH
HARRY A. SCHWARTZ

Business Staff

J. M. LATHROP
Advertising Manager

R. C. WELLMAN
Circulation Manager

New York . . . . . J. F. AHRENS
Chicago . . . . . L. C. PELOTT, G. A. POPE
Pittsburgh . . . . . S. H. JASPER
Cleveland . . . . A. L. KLINGEMAN

MAIN OFFICE

Penton Building, Cleveland, Ohio

BRANCH OFFICES

New York . 110 East 42nd Street
Chicago . 520 North Michigan Avenue
Pittsburgh . . Koppers Building
Washington . National Press Building
Detroit . . . 6560 Cass Avenue
London . . . . . Caxton House, Westminster, S.W.1.

THE FOUNDRY is published monthly by The Penton Publishing Co., Penton Building, 1213 West Third street, Cleveland, Ohio. JOHN A. PENTON, Chairman, Board of Directors; A. L. SHANER, President and Treasurer; J. R. DAWLEY and G. O. HAYS, Vice-Presidents; F. G. STEINEBACH, Secretary.

Subscription: United States, Canada and Mexico, $2.00 a year, Great Britain and other Foreign Countries, $4.00 a year; single copies 25 cents. Copies published three months or more previous to date of current issue, 50 cents each.

Member: Audit Bureau of Circulations, Associated Business Papers, National Publisher's Association. Copyright 1940 by The Penton Publishing Co.

Entered as second class matter at postoffice at Cleveland under the act of March 3, 1879.

ADVERTISING PAGES REMOVED

The Logical Oil for Cores

LINOIL

THE

Youngstown Foundry & Machine Company

Youngstown, Ohio

B. G. Parker

President and General Manager

writes:

"We are getting most excellent results in our foundry in using your core oils on both large and small cores.

"We have used cores made with your oils in castings weighing as much as 50 tons and have had the best of results.

"We have been using your oils for years and have always found your quality and service to be all that anyone could ask for." That's what Mr. Parker says.

CHICAGO — CHICAGO IN MAY — CHIC

THE WERNER G.

(DIVISION OF ARCHER

2191 WEST 110th ST. *Warehouse*

Boston, Mass.
Hartford, Conn.
Edgewater, N. J.
Philadelphia, Pa.
Birmingham, Ala.
Buffalo, N. Y.
Columbus, Ohio
Dayton, Ohio
Indianapolis, Ind.
Chicago, Ill.
Moline, Ill.

Canada—WERNER G. SMITH, Ltd. *Factory and Office,*

Editorial

British Editor Pays Tribute To A.F.A. Accomplishments

AN EDITORIAL appearing in the Feb. 1, 1940 issue of the British *Foundry Trade Journal* under heading "Foundry Technology in America," pays high tribute to the work and progress of the American Foundrymen's association since its founding 44 years ago. Officers, members and the host of men who have contributed to the success of the association during past years should take great pride in this exceptionaly fine compliment.

That nonmembers of the A.F.A. may learn of the high standing and recognized leadership accorded that organization throughout the foundry world, the discussion of our British contemporary is reproduced here. Surely no better sales argument could be found for association membership and the further enlargement of co-operative effort in the foundry industry of America. The editorial follows:

There is insufficient recognition in Europe of the debt owing to the American Foundrymen's association for the leadership it has invariably given since its formation more than 40 years ago in the technical advancement of foundry practice. Its successful launching by Mr. John A. Penton and the late Dr. Moldenke was quickly recognized by the more progressive foundrymen of the United Kingdom, and the formation in 1904 of the Institute of British Foundrymen (originally the British Foundrymen's Association) was a direct result therefrom. Although the United States are as old, industrially, as any other country, it has generally been the case that they have modelled their professional organizations along the lines of the earlier British ones, but so far as foundry practice is concerned, it must be conceded that they were the pioneers. Not only in the creation of technical organization were they the first in the field but also in most of the activities now generally associated with foundry technical institutions, except perhaps for the creation of Branches and a pure research body such as the United Kingdom possesses in the British Cast Iron Research association.

Perhaps, because of the great distances between the foundry centers in the American continent, it was originally found necessary to supplement the benefits derived from the annual conferences by the formation of numerous committees and subcommittees. To such an extent has this activity grown that the list to arrive here contains no fewer than 131 entries, including those relating to the official A.F.A. representatives on the committees of other bodies. To staff these committees 282 members hold office. As the executive staff of the A.F.A. consists of only five people, the organization is a fine testimonial to voluntary effort. A few years ago, the association undoubtedly felt the need for local activities in order to benefit those who found themselves unable to attend the annual congresses except on rare occasions. With thoroughness and commendable energy, the officers initiated a continent-wide campaign. In some cities local associations existed and these had to be converted into branches or "Chapters" as they are known in America, whilst elsewhere new ground had to be broken. The result is that now there are no fewer than eighteen chapters.

For social gatherings, it is not uncommon to read that 500 persons were present, and at a Christmas party held in Cleveland, the muster exceeds 750—a larger number than any foundry gathering—even international—ever held in this country! As the membership of the association is of the order of 3000, the support of its members must be exceptionally enthusiastic.

The work sponsored by the association is a model of what can be done by a technical institute as distinct from a research association. It has consistently made efforts to bring before its members any fresh developments by means of exhibitions and technical sessions. The assembly in report form of data on particular subjects, such as sand testing, costing, the properties of cast metals, and the like, has been particularly effective in creating utilizable yardsticks within the industry, on the one hand, and popularizing its products with potential customers on the other. Perhaps the latter activity ought to be undertaken, or at least paid for, by the employers' federation. Yet, if benefit accrues to the industry, it is immaterial in the long run who foots the bill. That benefit has resulted to the American foundry industry from the publication of the Cast Metals Handbook is undeniable, and similar effect is confidently expected from the newer one, "Alloy Cast Irons." Pure research work, such as that dealing with the behavior of refractories at high temperatures, is being sponsored by the association at the Battelle institute. The early results are of exceptional interest, but whatever the outcome, American methods are such that the findings will finally be reduced to such simple terms that the practical man will be in a position to apply them with advantage to his own practice.

In international co-operation, despite relative remoteness, the A.F.A. have been most enthusiastic, and we are well aware that there are many American foundrymen who owe the Nazis a grudge for having spoilt their plans for participating in last year's International congress. Since the inception of the scheme for the international exchange of technical papers, we estimate that the American contributions must now number close upon 100, constituting in themselves a valuable compendium of foundry technology.

The personnel of the United Kingdom foundry industry is both cognizant and appreciative of the very substantial help which has been given to it by the Institute of British Foundrymen, and it is desirable that it should be made aware of just what it owes to the influence, example and assistance emanating from the American Foundrymen's association.

Frank G. Steinbach
Editor

Rapid Delivery IS PRIDE OF JOBBING FOUNDRY

By EDWIN BREMER

PROMPT delivery of gray and alloy iron castings, designed to meet specific needs in a variety of applications is the watchword of the Carondelet Foundry Co., St. Louis. In the main, castings are shipped within 72 hours after the pattern is received, but a large output is completed within 24 hours. The foundry is operated essentially as a jobbing shop and is engaged principally in noncompetitive work. The latter field has been established by the Carondelet Foundry Co. through ability to supply the castings buyer with definite recommendations to fit his requirements, and to provide accurate laboratory and foundry control to meet his specifications—in addition to the previously mentioned rapid delivery service.

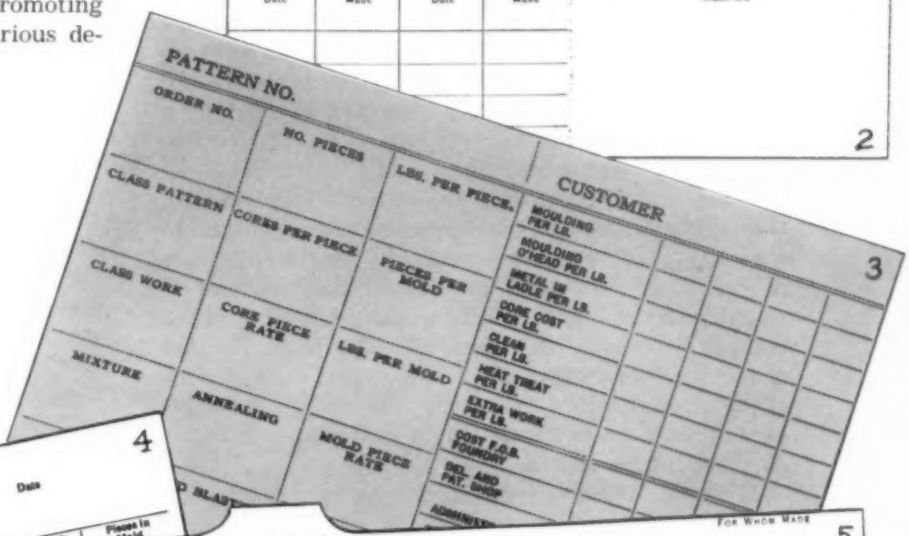
The firm produces two types of materials, namely plain gray, and alloy cast irons. These fill a wide variety of demands, in castings ranging in weight from less than an ounce up to 3000 pounds. The plain gray iron is employed in light castings which must have a high degree of finish for plating and enameling. In alloy cast irons more than 70 different compositions are available for heat, corrosion and wear resistant, and high mechanical property applications in oil field and refractory manufacturing industries, for high pressure valves, pump castings, ceramic molds and machinery.

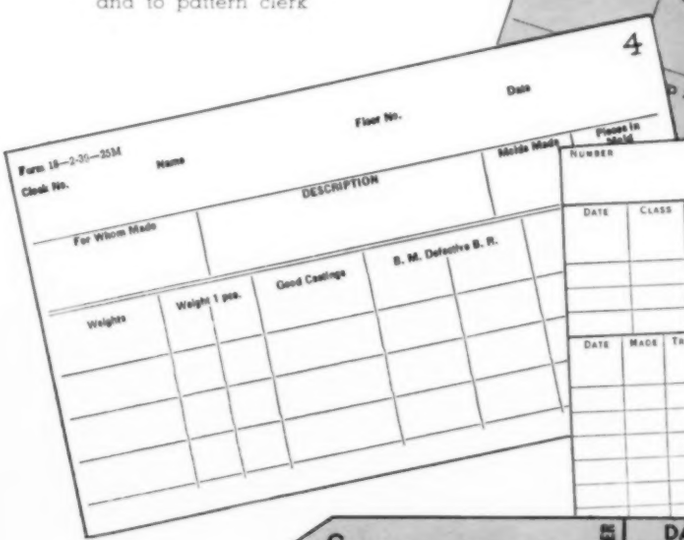
Maintain Close Contact with Field

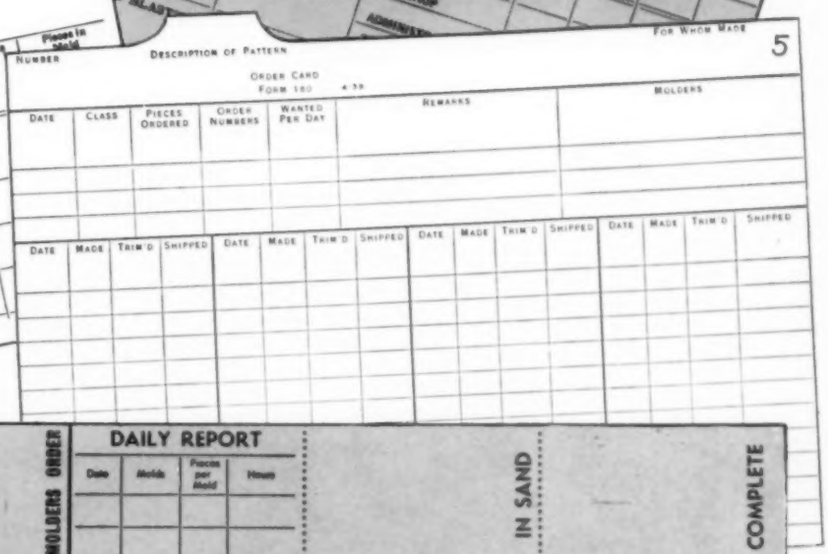
Castings orders are secured principally by direct call of the firm's salesmen who not only have engineering training, but also are experienced foundrymen. They maintain close contact with operating men, engineers, and maintenance men in various fields, and due to their broad training in engineering and in founding, are in an excellent position to make recommendations on suitable composition, design, pat-

tern construction, etc. Such service is advantageous not only to the customer, but also to the foundry. Possessing complete laboratory facilities the Carondelet Foundry Co. also engages in development work to provide definite compositions to meet specific applications.

The ability to provide prompt delivery service at all times has resulted from years of constant effort, and the close co-operation between management, sales, department heads, and key men. To further develop that spirit of co-operation, which is so essential in maintaining a smoothly functioning organization, a monthly dinner is attended by foremen and key men. The dinner is held the first Monday after the fifteenth of the month and at that time the cost analysis of the previous month is available for discussion. Various problems are thrashed out at the meeting, and these discussions aid in maintaining and promoting the delivery service, in co-ordinating the various de-







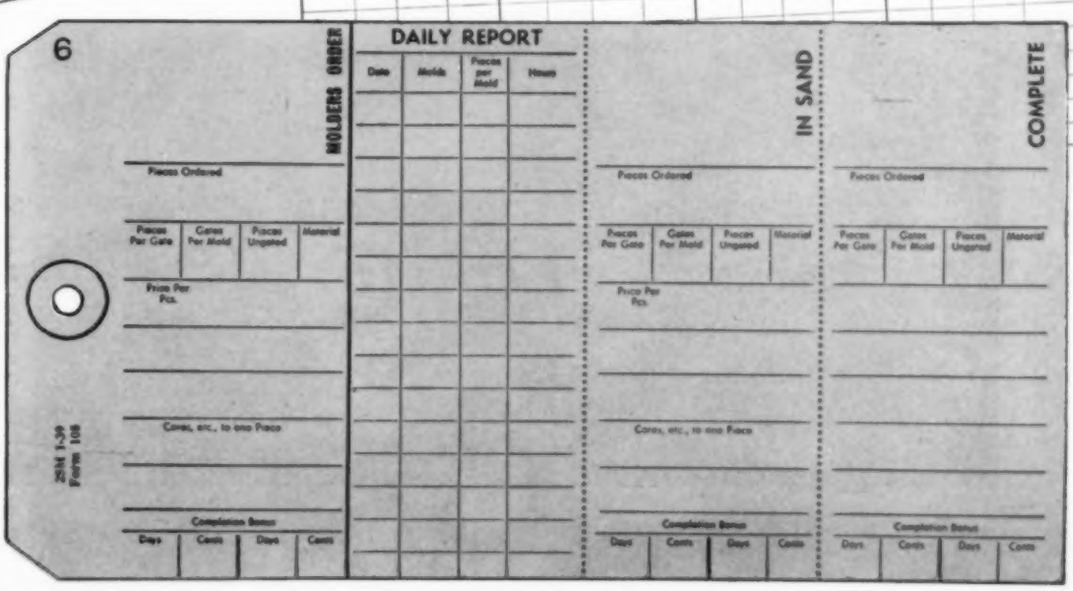


Fig. 1 (Left)—General view along one section of the foundry

Fig. 2—Core order record card. Fig. 3—Cost record form containing all essential information which is on permanent file. Fig. 4—Shipping clerk's temporary file. Fig. 5—Permanent record for shipping clerk's file. Fig. 6—Three-part tag which is attached to pattern with stubs going to production department and to pattern clerk

partments, and in controlling the production costs.

Since delivery of castings from the foundry on schedule depends upon strict adherence to a formulated plan, it will be of interest to describe the various steps followed, beginning with a request for a quotation. If received by a sales engineer, he consults a permanent cost file for past records of similar jobs, obtains correct molding and core making costs and makes out an estimate on a thin 4 x 6 inch card, shown in Fig. 3.

Estimate Card Is Checked

While the card is self explanatory it may be observed that the various items cover all essential phases required for an accurate cost picture. The engineer is competent to arrive at a proper cost estimate but he must turn his card over to the general manager for checking and final O.K., which is insurance against any possible errors in judgment or calculations. The quotation then is forwarded to the prospective purchaser, while the card is filed in a "pending file." If an order results the card is transferred to the permanent job cost file.

When the first castings on the order are shipped, the production cost figures are collected, compared to the estimates, and any necessary corrections are made. This revision is mutually beneficial both to foundry and customer in case of future orders. If the estimated price on the first order was high, the customer receives the benefit on the second. Conversely, if the price was low, the foundry has factual information to show the customer why a higher price is necessary on future orders.

When an order is received the pattern clerk looks up its history. If it is a repeater his record shows the type of metal to use together with any unusual precautions to take. He enters the metal number on the face of the order and makes out a tag, shown in Fig. 6. The tag, which is 4¼ x 8 inches, is perforated so that it can be divided into three pieces, which, respectively, are titled, from left to right: *Molder's Order, In Sand, and Complete.* Each of the pieces contains information on pieces ordered, description of pattern equipment, type of iron to use, cores to one piece and completion bonus. The section entitled *Molders Order* contains, in addition, a daily report which provides for entry each day of the number of molds and the hours spent. The back of the section entitled *Complete* contains space for entering molder's name, customer's symbol and pattern number. It is also ruled off into small squares numbered from 1 to 31 for entering the number of pieces made by the molder working on the job on a specific calendar day of the particular month.

Billing Clerk Collects Production Figures

The production department is now finished with the customer's orders and sends them to the general office at the end of the day. Here they are checked against the permanent cost card file, if a "repeater," the sales price is shown for the billing clerk. If no record exists the card (shown in Fig. 3) is made out leaving production figures blank. The billing clerk then must collect these before he can invoice the job, giving the complete data to someone capable of figuring the job and establishing the proper selling price for the casting.

A record of the order is typed in skeleton form on a 4 x 6 card, which goes to the (*Please turn to page* 94)

Fig. 7—Complete laboratory facilities are maintained

A·F·A· COMPLETING PLANS FOR GREATEST CONVENTION

THE Foundry and Allied Industries show and forty-fourth annual convention of the American Foundrymen's association to be held at Chicago, May 4 to 10, gives every indication of providing the most comprehensive Foundrymen's Week ever staged. The foundry show, opening with a preview on Saturday, May 4, will include some 250 individual exhibits, many of these operating and all displaying the latest developments of foundry equipment and supplies.

Following the Preview Day the show will be open from Monday, May 6, through late afternoon, Friday, May 10. Registration headquarters for the convention will be at the International Amphitheatre. Technical sessions during exhibit hours will convene in meeting rooms at the Stock Yards inn and the Saddle and Sirloin club adjacent to the Amphitheatre and other sessions will be at the Palmer house in downtown Chicago where the ladies' headquarters will also be located. The program for the annual convention will present a well balanced series of technical, management and shop operation sessions as will be noted from the attached schedule.

View along State street, one of the busiest in Chicago. Above—Palmer House, convention headquarters

Beginning Monday, May 6, over 21 technical sessions have been scheduled covering general interest subjects such as foundry refractories, plant equipment, sand research, apprentice training, foreman training, safety and health program, job evaluation and time study and patternmaking. In addition, each of the major divisions, namely, gray iron, steel, malleable and nonferrous, will hold several sessions covering research and practices in the production of various types of castings in all four classes of metals listed.

Two shop courses, each consisting of four sessions, have been arranged. One will deal with foundry sand control, the other with cupola melting. Discussion leaders will explain some of the most practical shop problems, with those attending being given an opportunity to present their special problems for solution. These shop courses, initiated in 1928, have continued to be one of the most popular features of the conventions.

A feature attraction of the convention will be the annual business meeting, Wednesday, May 8. The annual board of awards address will be given by Charles E. Wilson, executive vice president, General Motors Corp., Detroit. At that session the board of awards will present four A.F.A. gold medals as follows:

John A. Penton gold medal to Nathaniel K. B. Patch, secretary, Lumen Bearing Co., Buffalo, and past president, A.F.A.

J. H. Whiting gold medal to Frederick Ketchum Vial, director and vice president, Griffin Wheel Co., Chicago, and director and vice president, Association of Manufacturers of Chilled Car Wheels.

W. H. McFadden gold medal to Harry Walter Dietert, president, Harry W. Dietert Co., Detroit, and chairman of the Detroit chapter of the A.F.A.

Joseph S. Seaman gold medal to Frederick A. Melmoth, vice president and works manager, Detroit Steel Castings Co., Detroit.

At the same time, George A. T. Long, Pickands Mather & Co., Chicago, a (*Please turn to page* 84)

THE FOUNDRY INDUSTRY and Army Ordnance

By COL. NORMAN F. RAMSEY
Rock Island Arsenal
Rock Island, Ill.

THE foundry industry must not be dismayed with what was said in the first installment of this article in the March issue of THE FOUNDRY regarding the present dependence of the ordnance department on the foundry. It must be borne in mind that the illustrations given have been concerned particularly with mobile artillery carriages where reduction in weight is desired greatly. Franklin R. Hoadley, a former president of the Gray Iron Founders' Society came away from the ordnance demonstration at the Aberdeen Proving Ground last October greatly impressed by the real advance in ordnance, but with the feeling that there is a stupendous job ahead if industry ever is called upon to manufacture so many pieces of complicated ordnance on a real production basis. Therefore it behooves foundries to get plants into shape to meet the demands of a national emergency. This requires adequate capacity, modern and efficient equipment and a reservoir of trained labor.

It is essential that we should have on hand a sufficient supply of ordnance material to satisfy requirements of our field forces until industrial production is able to meet the needs. The more complicated and complex the equipment becomes, the greater will be the delay in getting into mass production. With this delay of 12 to 14 months there will be strenuous efforts to find substitutes which, although not so efficient, may be necessary to meet urgent requirements. Perhaps the weldments and forgings which have been successfully used in time of peace will have to be replaced by castings. If they are to be replaced, you can depend on it that because of the high speeds and terrific strains imposed by modern warfare, the specifications for war material will be considerably higher than for the usual peace time products of the foundry.

As an example, take our fighting tanks which use carefully fabricated heat treated armor plate for the protection of the crew and vital mechanisms. This armor plate in the thin sections required is produced by only three firms at the present time and months would be required to expand their plants to meet the requirements of the emergency. In France they have provided cast steel hulls for tanks. A French tank is shown in the accompanying illustration.

It would appear that the turret might well be made of a steel casting. By eliminating rivets and angle irons and rounding the covers of the present turrets, the increase in weight for that element should not be greater than for a built-up turret.

Present specifications for armor plate castings leave the chemical composition, heat treatment and methods of manufacture to the foundryman, but he is expected to submit with his bid information on each of those features which he expects to use in making the castings. As to dimensions, the castings must conform to the machine dimensions with a maximum positive tolerance of 1/16-inch for thicknesses less than one-half inch and 3/32-inch for thicknesses from ½ to 1-inch.

Castings, in addition to meeting the physical and ballistic requirements must, of course, be sound, clean, free from segregations, hard spots and defects which affect their strength, ballistic value, or appearance. To secure the best possible armor castings a bonus is paid for each lot of castings resisting complete penetration at impact velocities greater than the minimum requirements. This bonus is 5 per cent of the contract price for each 150 feet per second in excess of the minimum striking velocities specified.

A lot of castings must be of one melt, subjected to

This article, and one which appeared in March, are from a paper presented before the January meeting of the Wisconsin Chapter of the A.F.A.

The Editors

Photograph, Pictures, Inc.

the same heat treatment and not exceed 5000 pounds. One test plate of each thickness in the lot is taken as representative of the castings in the lot. Test plates and castings are tested at 100 yards range and no plate or casting is permitted to show complete penetration.

These present specifications are being revised continually. The ballistic requirements are increased from time to time. Present use of electric furnace steel will be continued until open hearth steel shows equal qualities. More and more initiative is being placed in the hands of foundrymen to develop better armor plate. Different alloys, new methods of heat treatment and improved foundry technique are being employed on this material in the same way that it is being employed in all other foundry products in which higher physical properties are sought with no increase but usually a decrease in weight.

From this brief review of requirements you can see that a very high quality of steel casting is demanded. Manufacturers are not awarded a contract until after they have demonstrated their ability to produce material of satisfactory physical and ballistic properties.

To produce built-up cannon requires expensive machinery, not readily available, and highly skilled mechanics which are becoming more and more difficult to obtain. To expedite their production the centrifugal casting of cannon has been developed by the ordnance department to the extent that with the cold work process, it has been used in manufacturing gun tubes up to and including the 3-inch antiaircraft gun.

Experimental castings for 155 millimeter howitzers have been produced and studies are under way to produce guns up to 8 inches in caliber by that method. In addition to the saving of time and money, elimination of the forging process in gun manufacture relieves one of the serious problems encountered in the production of cannon in an emergency. Action of centrifugal forces upon physical structures and chemical content gives a high quality casting. Improvement of quality is due indirectly to action of centrifugal forces which keep the metal in contact with the outside wall of the mold. This permits solidification of the casting, beginning with the outside surface and extending inward to the core. This directional control of solidification results in a dense macrostructure. As wall of the casting is thin compared with the cross section of an ingot, a fine dispersion of nonmetallics is obtained. There are no appreciable directional properties in the castings but transverse strength and ductility are (*Please turn to page* 98)

FUNDAMENTALS OF Cupola Practice

SOME of the fundamentals of cupola practice, which when recognized and provided for in operation, aid in attaining high degrees of performance are discussed in this article.

There are five zones in the cupola, namely: (a) preheating zone extending from the charging door down to the melting zone, (b) melting zone, (c) superheating zone, immediately below the melting zone but terminating at some distance above the main tuyere zone, (d) cooling zone in the area of the main tuyeres, extending from some distance above the tuyeres to some distance below the tuyeres, and (e) well or storage zone.

Melting point of materials used in a cupola charge ranges between 2100 and 2600 degrees Fahr. Without a superheating zone, metal which is released from the melting zone at a temperature close to the melting point, would be cooled in the tuyere zone and freeze solid in the well zone. Temperature of metal as tapped from the cupola ranges between 2450 and and 2850 degrees Fahr., being in the low temperature range when the charge contains materials of low melting point and in the high temperature range when high melting point materials are used. The increase in temperature between that measured in the tap spout and the melting point is due to superheating after some sacrifice of temperature due to cooling. Amount of superheat depends largely on length of superheating zone which can be altered somewhat by changing conditions of cupola operation. For example, a cupola operating with a wind box pressure of 5 to 10 ounces has a shorter superheating zone than one operating between 15 and 20 ounces. With other conditions being equivalent, the latter operating conditions results in hotter iron. If the iron is not as hot as desired, the temperature may be improved (a) by modifying the type of materials in the cupola charge to include materials with a higher melting point, (b) modify the type of cupola operation toward increasing the length of the superheating zone, or (c) decrease the drastic cooling effects of the tuyere zone. The author does not intend to infer that coke is not an important consideration in discussing metal temperatures, but only to show that other factors involved in cupola practice also have a bearing on metal temperature.

In most cases the cupola air supply is not preheated and enters the tuyere zone at room temperature or less. It takes some time for air and fuel to unite and reach the ultimate flame temperature, the condition of the superheating zone. The cooling effect of the cooling zone is at least 100 degrees Fahr. and may approach 250 degrees.

Conditions which decrease the magnitude of cooling in that zone are, (a) preheating the air supply, (b) using the smallest practical size coke, (c) using a generous volume of slag, about 80 to 100 pounds of slag per ton of iron, and (d) remove metal from the well zone of the cupola with the least possible time lag.

The coke bed serves, (a) as a supporting column for iron and coke, (b) to form a melting zone, (c) to form a superheating zone, and (d) to preheat refractories in the well zone and the sand bottom of the cupola.

We all know that the first iron tapped from a cupola is likely to be cold or at least colder than metal from subsequent taps, but we may not know that the temperature of this first iron and the amount that is of sub par temperature is directly related to the temperature of the sand bottom and refractories in the side wall.

It is common practice to allow about 1 hour from the time fire is started in the bed coke until charging is started. This time, of course, varies a little with, (a) weather conditions which affect the draft of the cupola, (b) the size of the cupola, and (c) the size of coke in the bed. It is unlikely that the sand bottom and cupola refractories can become preheated sufficiently hot in one hour to keep from absorbing a lot of heat from the first iron melted, so if the first iron is cold and especially if the amount of cold iron is excessive, a lot can be done to eliminate the condition by lighting the bed earlier and allow more time for the sand bottom to absorb heat. In some cases it is not too long to let the bed coke soak for 3½ or 4 hours.

It is not uncommon to select the coke for the bed, using the larger lumps. Although that practice has considerable merit, in that it aids in keeping the first irons within the carbon limits desired, it is not

without fault. The larger the lumps of coke in the coke bed, the more difficult it is to preheat the sand bottom to a suitable temperature. It is less difficult to light up a cupola when the coke bed is made up of large lumps of coke but the light-up may be of a superficial nature.

Although the use of the coke bed as a preheating medium for the sand bottom and refractories in the well zone is not the most important function, it becomes increasingly so as the size of the cupola decreases or as the desired quality from the first iron increases. In those foundries operating small cupolas or melting expensive materials, the importance of preheating may outweight the various other functions of the bed.

It is unavoidable that some nonmetallic materials such as, ash after the coke has been consumed, sand on sprues and gates, rust on materials that have been exposed to the weather, etc. enter the charging door of a cupola. Even if we could operate a cupola without including any impurities in the charge it would not be desirable to do so. The cupola process oxidizes a small amount of iron and unless there is silica material present in the charge, this oxide will combine with the silica of the cupola lining to increase the refractory problems of the cupola. However, small amounts of silica in the charge alleviate that problem.

When a cupola is operated for any length of time, the charge always contains some type of flux which serves to coagulate the nonmetallic silicates and oxides of the charge. Fluxing materials charged into a cupola are limestone or dolomitic limestone, which may be supplemented with small quantities of fused sodium carbonate or fluorspar. In some cases the cupola charge may contain burnt core sand, purposely added to create a volume of slag.

The cupola slagging operation serves (a) to keep conditions in the cupola uniform from the start to the end of the melt, (b) to filter nonmetallic impurities from drops of iron as they pass through the slag layer into the metal bath in the well zone, and (c) to insulate the metal in the well zone from the cooling air currents which are to be found in the tuyere zone.

The laboratory analysis for silicon does not distinguish between the amount of silicon in iron and the amount of silica there as an impurity. Those who melt a rather high silicon iron and operate for more than 2 or 3 hours may have noticed that the laboratory reports on silicon for the first part of the days melt are higher than those reported after the operation settles down. This is due to a higher silica content in the first iron charges melted.

Even though from three or four times the normal limestone charge is added on top of the coke bed before the first iron charge, the iron starts to melt quite some time before slag is formed. It would be desirable to add some flux to the bed coke before the point when its full height has been reached.

Slag is removed either through a slag hole located at a point above the top of the tap hole and below the tuyere level, or through the breast opening when using a front slagging spout. Size of the slag hole has an important bearing on cupola operation in that

By

DON J. REESE
International Nickel Co.
New York

This article is from a talk presented by Mr. Reese at a shop operation session at the Cincinnati convention of the A.F.A., and since discussed before a number of chapters, local associations and regional conferences.
The Editors

it is a source of air loss. A 2-inch diameter hole located about 6 inches below the tuyeres will do a good job. Use of a front slagging spout, eliminates the need for a special slag hole and the many problems involved around the slag hole. It is an easy way to remove slag but it is not always convenient to handle slag at the front of the cupola where conditions are crowded.

The oldest and most common method is intermittent tapping. Large cupolas frequently have a calibrated tap hole, running a continuous stream of metal, with a constant head of metal in the well and continuous flow of slag. The front slagging spout method is finding increasing usage. Whichever method is used, the practice followed in tapping has a definite relationship to the quality of iron produced, the temperature of the iron and the method of slagging the cupola.

Stop Breast During Early Blowing

Intermittent tapping introduces problems of getting slag in the tuyeres, variations in quality of iron due to variations in time between taps, variation in the monolithic refractory bot material, etc. It is common practicé with that type of material to leave the tap hole open, after the blast is started, until first iron appears or until a small stream of iron is running. The practice should be discouraged. During that period the cupola is adjusting itself for operation, with an open breast hole and an air loss. That loss is stopped when the cupola is botted up but a second readjustment within the cupola is required. To plug the breast hole with an oil sand core before the blast is started is better practice.

It has been stated that large cupolas are operated with a calibrated tap hole. That method of tapping is practical on cupolas melting more than 10 tons of iron per hour, where the diameter of the tap hole is ⅝-inch or more. The problems of running metal through a tap hole increase with increasing depth of the breast and decreasing diameter of breast opening. With that type of tapping, there is a constant head of metal in the cupola so that the slag level is maintained constantly at the slag hole, a desired feature for slagging. However, metal is in constant contact with coke and cooling air currents from the tuyeres so that the metal temperature is a little lower and the carbon content of the iron a little higher than with front slagging spout.

The front slagging spout method of tapping is suitable for continuous tapping regardless of size of cupola. In fact it has been used under 1-ton per hour. As there is only a very small quantity of metal in the cupola, the metal leaves the cupola at higher temperatures than with other types of tapping and with a lower carbon content.

While some foundrymen use the well zone of the cupola as a mixing zone, it should be remembered that it also is a cooling zone and a carbon pick-up zone. Frequently a superior job is done when using a reservoir ladle outside the cupola.

Cupola refractories may be too low in quality to withstand the temperatures generated and too porous to oppose slag peneration. An often ignored reason for an important part of refractory wear is bridging or hanging in the cupola. The charging gang notices a hang-up when it lasts for 5 minutes or more but cannot discern minute bridging of ½ minute to 5 minute duration. The cause of the trouble is large scrap or large coke or both. Evidence of the trouble is found in a wide fluctuation in metal temperature. The correction of the trouble is to use materials of the proper size.

The cupola differs from all other types of furnaces used to melt cast iron in that metal and fuel are in constant contact from the time the cupola is charged until metal flows through the slag hole. The quality of cast iron produced is partially dependent on the amount of carbon in the iron, which in turn is related to conditions of melting.

The possible range of carbons in cupola melted cast iron is from 3.70 per cent plus down to 2.00 per cent. Whatever the desired carbon level may be, the operator should strive to control the variation above and below the desired level to a narrow band. It is possible to so operate a cupola that carbon control may be within ±0.05 per cent, which is within the limits of analytical error in a laboratory using a well prepared sample for carbon. However, good carbon control is within ±0.10 per cent. For example, if the desired carbon level is 3.00 per cent total carbon, it is possible to control the variation between 2.95 to 3.05 per cent while the spread with reasonably good control is 2.90 to 3.10 per cent. Generally a much wider band of carbon variations are permitted in the industry.

Steel in Charge for Low Carbon

The main reason why a cupola charge contains steel scrap is to produce an iron with a lower total carbon content. It is not enough to use 20, 40, 60, 80 per cent, or more steel scrap in the cupola charge and expect to produce irons of decreasing carbon contents. In some types of operation a cupola with only 20 per cent steel in the charge may produce a lower total carbon iron than with another type of operation in which 80 per cent steel is used. Decreasing the carbon content of the cupola is only one of a number of factors involved in attaining the desired carbon level and controlling the carbon at that level. Amount of coke in the intermediate coke charge, size of the coke, method of operating the cupola, quality of the coke and method of tapping the cupola are important.

The carbon pick-up in melting increases (a) as the carbon content of the charge decreases, (b) as the amount of coke in the intermediate coke charges increases, (c) as the melting rate of the cupola decreases, (d) as the temperature of the metal increases, (e) as the solubility rate of the coke in molten iron increases, and (f) as the amount of time that molten iron lies in the well increases. Carbon control at the desired level is largely concerned with control of the melting process but with special emphasis on the tapping technique.

The author's particular (*Please turn to page* 92)

AVOIDING DEFECTS IN THE Nonferrous FOUNDRY

By N. K. B. PATCH

IN RECENT issues of THE FOUNDRY, we have discussed prevention of defects in nonferrous castings as they are found in different regular alloys. It might be well to summarize generally the picture from the angle of the defects, rather than from the angle of the compositions. Any practical foundryman knows that there are a wide variety of defects, any one or more of which means rejection of the castings, particularly when the castings are made and sold by a jobbing foundry. Castings produced by a captive foundry often are accepted by the machine shop more or less conditionally, and upon being machined are accepted as "good enough." Were these castings made by a jobber and sold to that same machine shop, they may not be accepted as good enough.

Customer Is Entitled To Best

In a large number of instances they are not accepted simply on the assumption that having been purchased under a general specification, the customer is entitled to the best. A fly speck or microscopical pin hole may be the cause for rejection in such an instance, and yet the casting commonly would be acceptable if delivered from the captive foundry. This is one reason why jobbing foundries must give this subject of defective castings a most thorough study. Before shipping to the customer they should be prepared to reject, in their own plant, any castings that indicate defects which promise trouble, even after the surface has been machined.

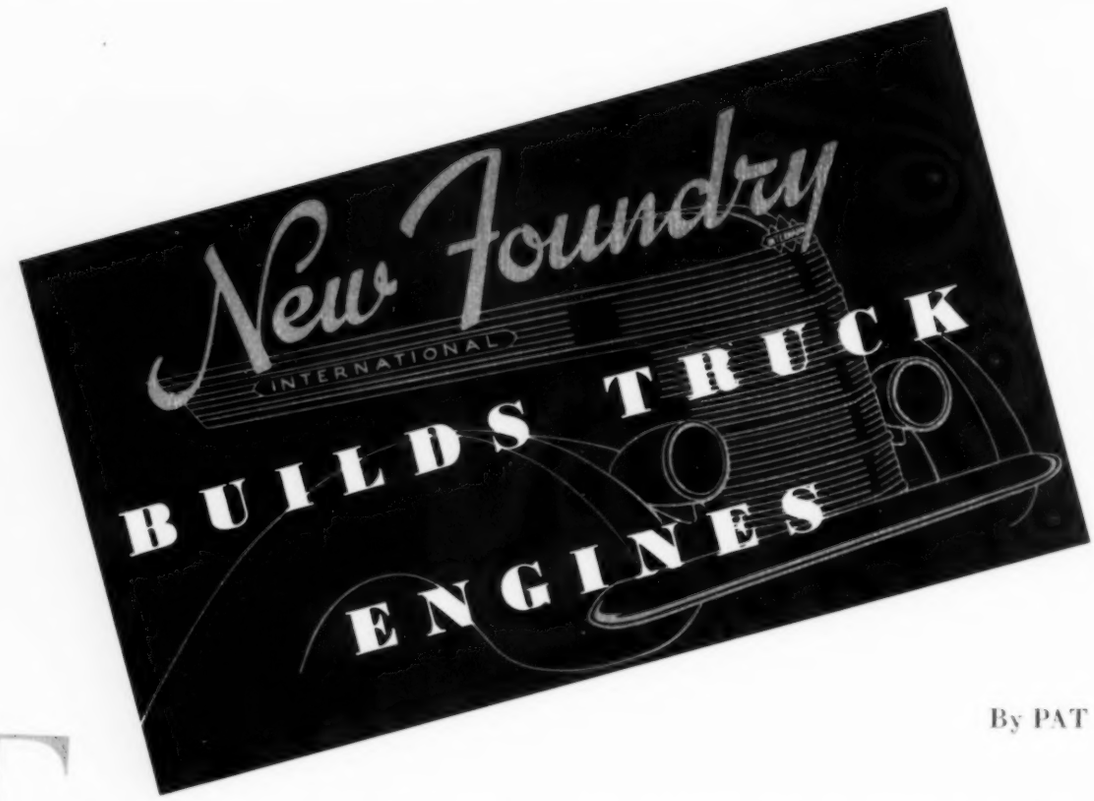
Not so long ago some foundries felt they could ship castings with surface defects that promised removal upon being machined. Today, conditions demand that if a foundryman is not quite sure these defects will disappear in the machining process he should scrap the casting in his own plant and not ship it to the customer if he wishes to avoid two sources of annoying experiences. One, the final rejection of the casting by the customer; and two, a controversy with the customer, usually a satisfied customer, but under the circumstances might even be a lost customer.

Some types of defects are only skin deep. They are easily removable by the machining process, if the necessary amount of metal is available. Certain other superficial or surface defects, even though they will disappear during the machining operation, give the machine shop such an annoying problem in their removal, that they become a source of argument and ill will. These defects include scabs, burned sand into the skin, and core sand burnt in on the cored surfaces. It is advisable for the foundryman to correct this difficulty at once before it becomes a bone of contention between his customer and himself.

Although we have discussed them in previous articles, we can list the different types of defects and also list therewith the predominating causes that produce these defects. A study of these, and the material in the proceeding articles will complete a picture of the kind of defect, the cause and the best methods for correction or prevention. These defects might be classed under several major divisions. Those having to do with the type of metal, method of melting, temperature of pouring, or the like. Those having to do with molding the casting; with the pouring and the composition of the mold during pouring; effect of the pouring through the different types of gating; and the different riser provisions. There may be another major group, but these three really cover most of the defects.

Castings May Be Cracked

In the first major group, the predominating effect is that of shrinkage cavities, or shrinkage cracks. Sometimes these cracks are so fine that they are not visible to the naked eye until some machining operation has relieved the strains of the casting so the cracks open up. Had the casting been fractured for examination, these cracks would have been the weakest point, and, therefore, the fracture would have taken place through the weakest point, or the crack. Cracks occur while the casting is at an elevated temperature. The surface is discolored and definitely indicates that shrinkage was the cause. Structure of the metal would show strain and would exhibit the typical characteristics of shrinkage conditions, indicating that the casting (*Please turn to page* 88)



By PAT DWYER

THREE mechanically operated molding units for the production of light castings occupy a section of the main floor immediately south of the heavy molding units in the new foundry of the International Harvester Co., Indianapolis, described in recent issues of THE FOUNDRY. Equipment includes overhead flight conveyor sand hoppers over molding machines, mold conveyor, weight lifters, shakeout, apron conveyor, vibrating casting and sand separator, troughed belt in basement for shakeout sand, two cleanup belt conveyors, floor hoppers and grating.

Prepared sand is brought to the unit on the belt conveyor from the central sand preparing system and discharged into the trough of the flight conveyor. Steel flights mounted on two strands of roller chain move the sand in the trough to the hoppers above the molding machines. This method eliminates the service of a man over head. The hoppers automatically are kept full. Overflow sand is chuted to one of the cleanup belt conveyors and returned to the system.

In the unit shown in Figs. 35 and 39 the molds are made on a battery of 20 jolt squeeze molding machines arranged in a double row for snap flask jobs only. Breeches sand hoppers converging at the top in pairs under the flight conveyor and spread wide apart at the bottom, supply the molding machines with sand. The mold conveyor of the index type carries a series of plates connected together

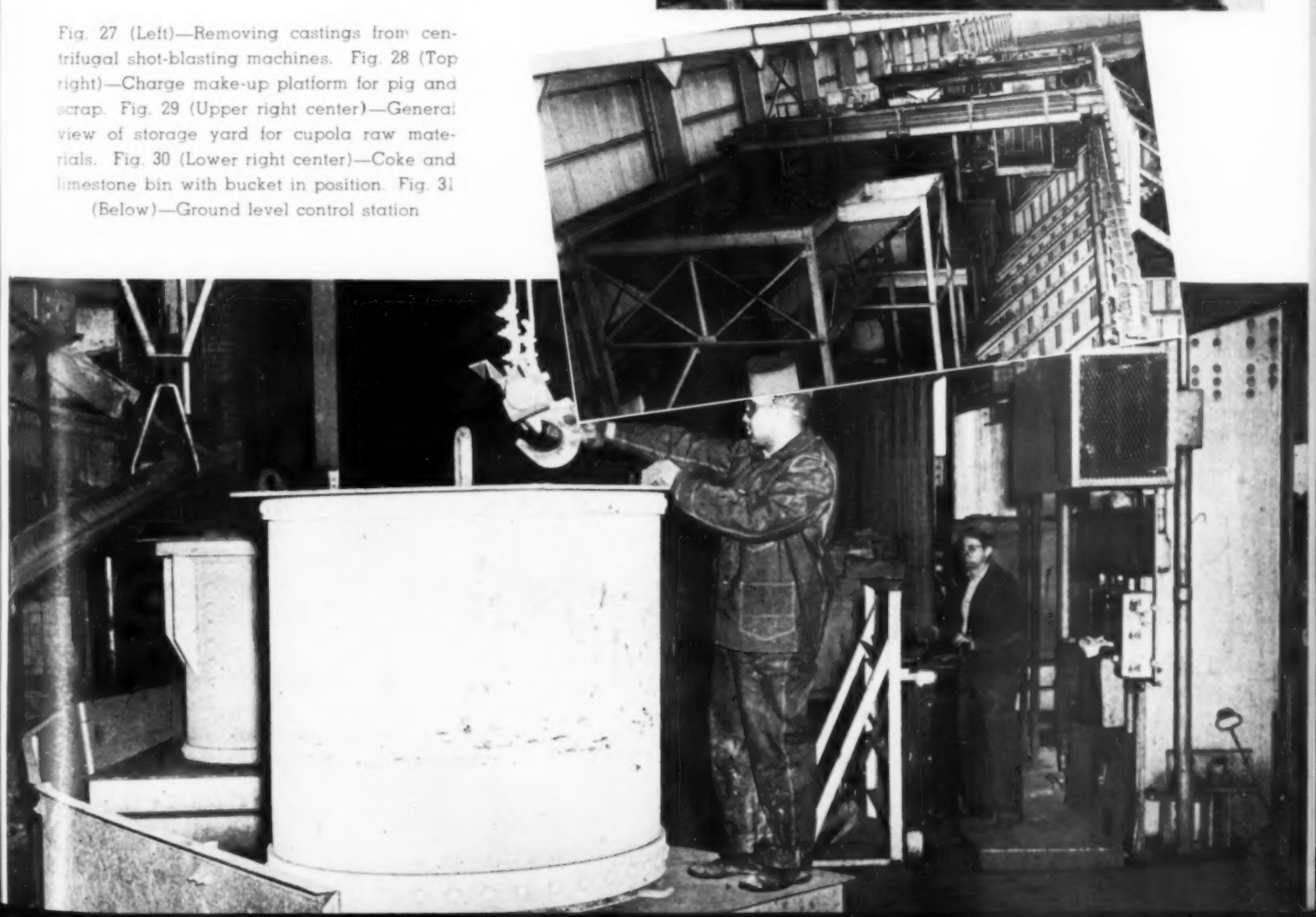
to form a continuous loop, but unlike the usual type running conveyor remains at rest during the molding and pouring operations. In this particular installation 36 plates are divided into three groups of 12 each and are indexed and moved at predetermined intervals into each of the zones located adjacent to the conveyor for molding, pouring and cooling. Each molder is provided with one molding plate per index group or a total of three molding plates on the complete conveyor. The three plates are indexed into a definite position in the three zones and convey the molds, bottom boards and other equipment pertaining only to that particular molder.

A stationary molding plate is provided immediately adjacent to the molder at each molding position. This plate is the individual molder's private miniature molding floor. The plate has an overall length of 6 feet, sufficient area to accommodate an average of five molds on each side of the plate.

Indexed time between conveyor movements is determined to provide sufficient conveyor space for the molder producing the maximum number of molds. Operating in this manner, ample space always is available for any molder regardless of whether the production is maximum or minimum. Each molder's operation is entirely independent and free from all interference by other molders.

At the end of the index period a signal bell rings automatically for approximately 6 seconds and then the conveyor automatically moves forward a distance

Fig. 27 (Left)—Removing castings from centrifugal shot-blasting machines. Fig. 28 (Top right)—Charge make-up platform for pig and scrap. Fig. 29 (Upper right center)—General view of storage yard for cupola raw materials. Fig. 30 (Lower right center)—Coke and limestone bin with bucket in position. Fig. 31 (Below)—Ground level control station



or group of 12 plates. This movement brings to each molder another individually miniature floor with his own flasks, bottom boards and any other special equipment.

Each plate of molds stops in the same position during each pouring index. When not in use, the weights and jackets are suspended from pendant hangers as shown in Figs. 35 and 39. The molds are in stationary position while the attendant applies the jackets and lowers the weights. One of the advantages claimed for this type of conveyor is that the molds are stationary while in the pouring position. The pourer has definite knowledge of the type of molds in each group and can act accordingly.

Since the same mold is indexed in the same position each time it comes around to the pouring zone, the weights always are in exact position to be lowered into place. Through an ingenious piece of lever mechanism one man readily handles the weights with little effort. This is in marked contrast to the amount of labor involved where the weights are lifted and replaced in the ordinary manner by hand, amounting to approximately 250 tons in an 8-hour day. At the end of the period the conveyor is set in motion. The poured molds are moved forward the requisite amount and replaced by another set.

Molds remain in the cooling zone for one period and then are dumped automatically in succession as the plates on which they rest move forward toward the mold station. Rollers and cams lift each plate to an angle of 45 degrees. Sand and castings slide off the bottom boards and fall into an apron conveyor. A narrow raised ridge along the bottom of the plate prevents the bottom board from sliding with the sand. The entire operation is automatic in a dust sealed compartment and eliminates the necessity of maintaining an attendant or attendants at this hot dust point.

The apron conveyor is designed to run at two different speeds. While the mold conveyor is running, the apron conveyor moves at the same speed. When the mold conveyor stops periodically, the apron conveyor automatically changes to a slower speed and continues at that speed while the mold conveyor is at rest. This arrangement provides an approximately uniform flow of sand throughout the system. Castings and sand are discharged over the head of the apron conveyor into a vibrating casting separator where the sand falls through openings in the deck plate. Castings pass over the end and fall into a cooling mill, a long steel cylinder, to emerge later at the opposite end for distribution to the sorting and inspection stations, the grinding stands, chipping and tumbling barrels.

Sand falling through openings in the deck plate of the vibrating separator is deposited on a belt conveyor running directly under the apron conveyor. This belt carries the sand to a second belt which discharges into the sand conditioning system. Sand spilled by the molders at the molding station falls through floor gratings into hoppers and then on to two clean up belts leading to the central sand conditioning plant.

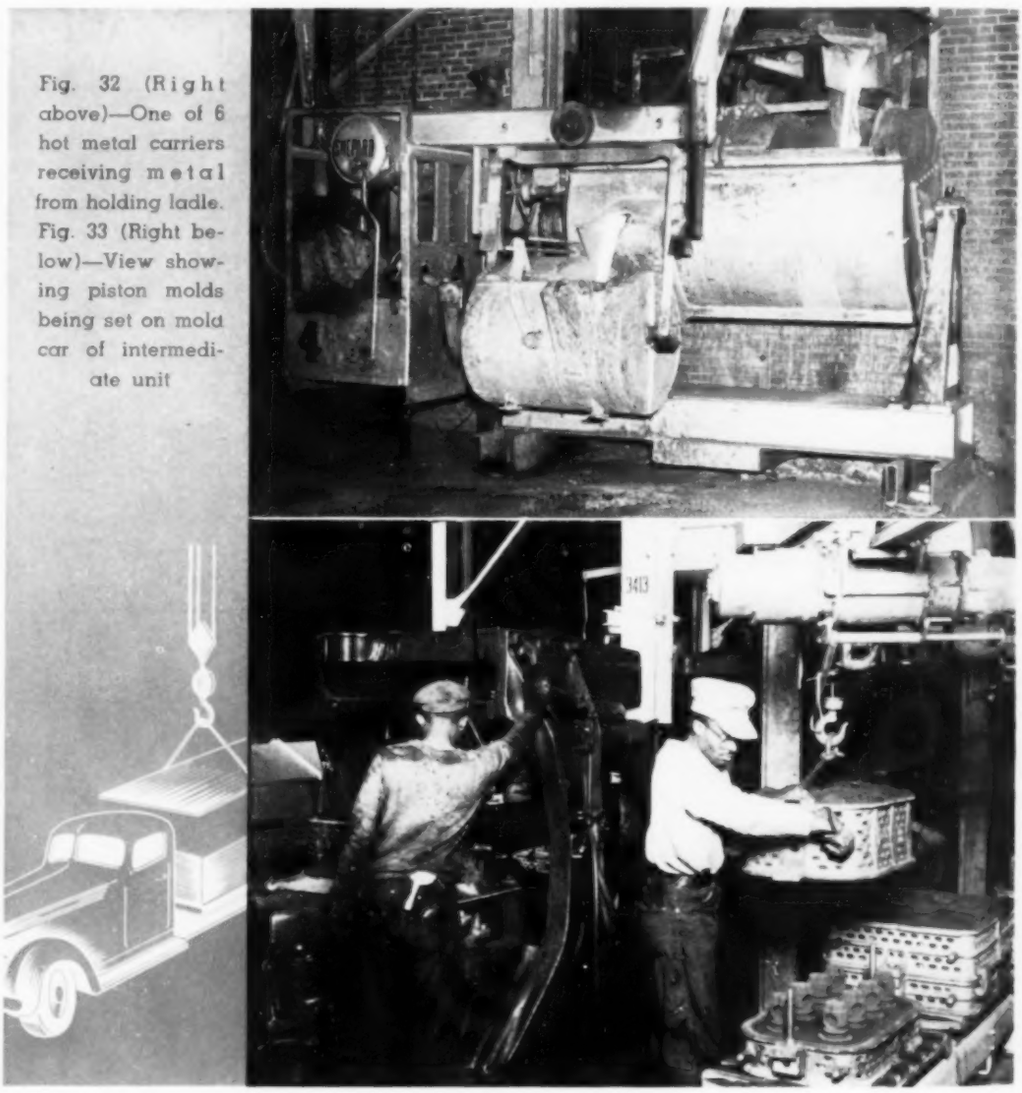


Fig. 32 (Right above)—One of 6 hot metal carriers receiving metal from holding ladle. Fig. 33 (Right below)—View showing piston molds being set on mold car of intermediate unit

The system of molding provides the advantages of conveyor operation combined with the advantages of stationary molding and pouring including no waiting for space on conveyor on which to set mold; correct bottom boards returned; bottom boards picked

up readily; jobs changed readily, only a maximum of 16 bottom boards required per job; unwanted bottom boards quickly removed; stationary pouring; jackets and weights always in correct position; easy to change jackets and weights, only maximum of 5 sets required per pattern; pourer knows contents of molds; different grades of iron can be poured; no men required at shakeout; shakeout enclosed; positive checking of production for piece work pay basis; trouble quickly detected by lack of molds on section; no poured molds pass shake out; stationary conveyor minimizes pouring hazards; molds poured at definite speed.

Several interesting features of the piston molding unit are shown in Fig. 33 where two jolt squeeze molding machines are employed inside a conveyor, one partly visible in the background making the drags. The copes are made on the machine shown in the left foreground. With the conveyor moving with the sun, or in a clockwise direction, the drags are placed on the conveyor first and move forward to a position where the copes are lowered into place.

Molds are green sand with the exception of the cores, oil bonded sharp sand units baked in an oven to eliminate the hazard always present where a projecting body of green sand is surrounded by molten metal. The eight cores for each mold are inserted in suitable cavities in the pattern plate. A flared collar on each core projects $\frac{3}{4}$-inch above the plate. Green sand rammed in the drag grips this collar firmly and holds the core in place during the rolling over movement and later when the mold is filled with metal. This is an adaptation of and an improvement on the old foundry kink first (probably) developed by the makers of machine tool castings for holding T-slot cores.

The illustration also shows the two types of bails or slings employed in handling the flasks. Two bent steel rods are attached to a central link suspended from the crane hook. Each rod for handling the drag flask terminates in a toe bent at right angles which fits into a hole provided for the purpose in a square boss on the center of the drag end. Suspended on two swivel points the drag readily is lifted from the pattern plate, inverted while in the air and lowered on to the conveyor. The cope is not rolled over. Therefore instead of the bent toes, each rod terminates in a flat cam hook which engages the center of the upper flange on the flask. Each flask part is a one piece steel casting with a great number of large vent openings in the sides and ends to permit easy escape of gases.

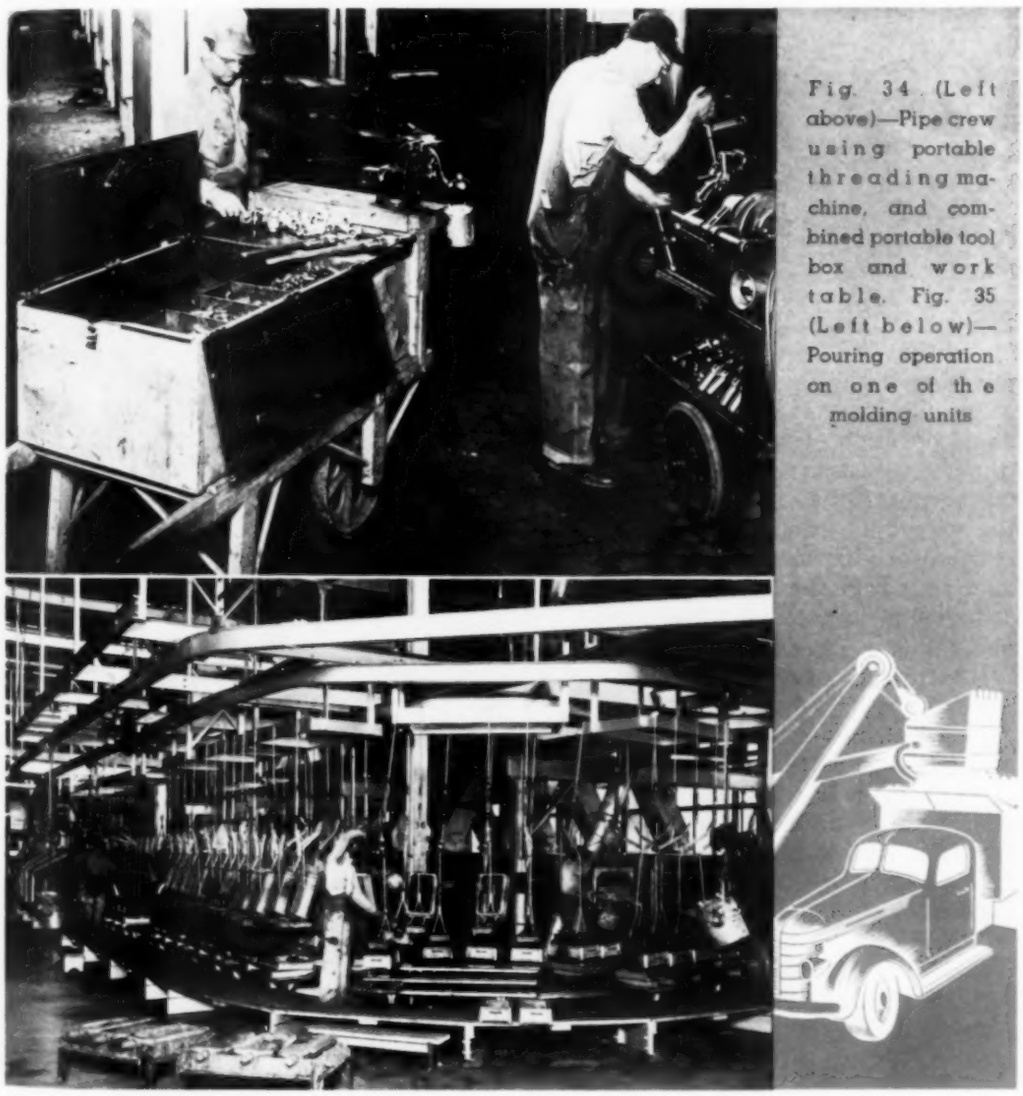


Fig. 34 (Left above)—Pipe crew using portable threading machine, and combined portable tool box and work table. Fig. 35 (Left below)—Pouring operation on one of the molding units

Gating system on the pistons is comparatively simple. Metal is poured into a basin on top of the cope and flows through a strainer core into a 1-inch diameter sprue in the center of the mold. A straight runner with small pocket extensions on the upper side to serve as dirt catchers, conducts the metal to small flat gates through which it enters each of the eight mold cavities simultaneously. Vent from the cores passes through the drag, which has no bottom plate but rests on a number of transverse ribs on the conveyor plate. The drag is lifted directly from the plate and placed on the conveyor. The cope is engaged by a lifting device in the molding machine, removed from the pattern plate, carried back between the upright members of the machine and deposited on a runout table. At this point the cope is (*Please turn to page* 102)

Questions and Answers

Steam Generated in Mold Causes Draw Resulting in High Loss

We are forwarding three flange castings, typical of a production job on which our loss runs from 50 to 70 per cent through segregation. The two smaller castings are mounted two on a matchplate. The larger casting is molded from a wood pattern. We place wire chills in the bosses. The cupola charge is made up of 40 per cent No. 2 foundry pig iron, 30 per cent miscellaneous scrap and 30 per cent shop scrap. Analysis shows: Graphitic carbon 2.69 per cent, combined carbon 0.83 per cent, manganese 0.57 per cent, phosphorus 0.29 per cent, sulphur 0.06 per cent, silicon 1.77 per cent, nickel 1.00 per cent. Bosses on small castings are solid and bosses on large casting are cored with 37/64-inch ram-up cores.

The mold and not the metal is responsible for the defect in each of the castings submitted with your inquiry. Either through extra moisture content or hard ramming, the metal boils slightly in the lower part of the mold. Most of the steam passes up through the mold cavity and escapes through the sand or through the riser. A certain amount is trapped here and there. The boiling action causes the metal to freeze in the vicinity and thus prevents homogenous shrinkage from taking place as the metal in the entire casting passes from the liquid to the solid state. In the larger casting a continuous cavity extended from the opening to the top of the wire chill.

Apparently in this instance the wire was either damp or rusty, or both, and developed a quantity of gas when heated by the molten iron. The remedy for this condition is obvious. An increase in the permeability of the molding sand is desirable in all instances. Possibly the main core or the bolt cores in the two smaller castings are a little too hard and the iron does not lie against them quietly. Again, it may be that no proper provision is made for escape of gas through the bottom of the drag. If the board is squeezed on the drag in the usual manner, the steam cannot escape. This is an unimportant factor on certain types of castings, but is a vital factor in the present instance. Place a 3-inch diameter plug in the center of the corebox to produce a shell instead of a solid core. Place a 1-inch sprue plug on top of each pattern in the cope, or sink a corresponding hole with a sprue cutter before the core is lifted. This will provide a clear vent.

Casting After Machining Shows Bright and Dull Areas

We are sending a gray iron casting which has been machined. You will note that the machined parts have a mottled appearance showing shiny, bright areas and dull areas. Can you tell us what is the cause of this condition, and how it may be overcome? Would you expect iron of this kind to have good macinability? The casting has been given a short, gray iron anneal.

Examination of the machined surface under an ordinary magnifying glass shows that the bright patches are open in structure showing numerous fine little pits or holes as opposed to a more dense, uniform structure in the dull and larger areas. That indicates to us that cooling in the sections denoted by the bright areas has been slower than in the other portions, permitting greater precipitation of graphite and formation of a coarser grain structure. Some of the coarse graphite has been torn out by the tool leaving the small pits or holes.

Trouble may result from your procedure in annealing in that you do not obtain uniform and slow heating and cooling. You do not mention temperatures or durations, but we imagine that heating at 1000 degrees Fahr. for about 20 minutes should serve. The castings must be permitted to cool slowly to obtain

A large group attended the Iron, Steel and Allied Industries conference at Del Monte, Calif., as mentioned on page 63

the full benefit. Further examination of the casting shows a void or shrink in the heaviest section of the bearing or gland, and also a somewhat similar condition but not quite as bad at the heavy section at the open end. Those defects lead to the opinion that your iron is too far on the soft side for that casting. We suggest that you decrease the silicon content or make such other changes as will result in closing up the iron sufficiently to eliminate those defects.

Many factors enter into the question of machinability, and it is difficult to say by looking at a casting whether or not it is easily machined, even though you may know the composition. Offhand, we should say that, looking at the structure, your casting should be easy to machine. However, due to the fact that you do not have a uniform structure, a machinist may say that it is harder to machine than one with a uniform structure.

Defective Castings Are Result Of Gases from the Core

We are sending a section of a defective pump body weighing 25 pounds, of which we have made a great many with only the ordinary loss. One day recently we lost over 50 per cent, due to pinholes which show up mostly around the core prints after being ground. The castings are made in green sand with a moisture content of 6 to 7 per cent, permeability 40, and green compression 5.2 pounds. The cores are made of 2 parts of Provincetown sand (open) with a grain size 22, 1 part Providence sand grain size 200, mixed 1 part of sand to 40 parts of core oil. The cores are well vented and strong.

Appearance of the small holes you mention, and which are globular in shape with glossy interiors indicate to us that your difficulty results from the cores, in that the gases from the core did not escape properly. That surmise or opinion is born out by your statement that the trouble was concentrated at the core prints. With that phase of the problem settled, the next is to determine the reasons for its occurrence at the particular point involved.

The first cause that enters the mind is a plugged vent. Presumably it is not in the core itself or otherwise the gases from the core would penetrate other parts of the castings rather being confined to the print. Consequently, it must be assumed that the plugging occurred at the end of the print, or in other words, in the sand which composed the mold proper. That is to say, the gases left the core, and being unable to pass through the mold came back along the core print to the interface between the mold and the molten metal. Possibly the molder forgot to cut the vent from the end of the core print to the flask joint, or he did not make it large enough. Another possibility is that through an error, too much binder was used in the core, and a much greater volume of gas was formed than ordinarily is the case.

Heat Treatment for Castings Made in Permanent Molds

We shall appreciate information on books or articles containing information on casting gray iron in permanent molds. Also on the subsequent heat treatment to relieve strains and reduce hardness.

The subject of heat treating gray iron of various compositions and under a wide variety of conditions has been presented in a long list of papers published in THE FOUNDRY and in the *Transactions* of the American Foundrymen's association. Plant descriptions of places where castings are made in permanent molds have included reference to the operation and temperature of the annealing furnaces. So far as we know, no book published has been devoted exclusively to the subject of permanent molds, construction, operation, treatment, temperature and the subsequent heat treatment of the castings. More or less extended reference to the subject is contained in several books.

For example a complete chapter on the subject of heat treatment of cast iron is included in *Gray Cast Iron*, by J. W. Bolton. The following comment taken from this work applies to your particular problem: For ordinary irons heating to 1500 to 1600 degrees Fahr., allowing just enough time for heat penetration, and cooling slowly to 1200 degrees Fahr. or below, will produce almost complete annealing. However, such annealing usually is accompanied by loss of considerable tensile strength.

Slower annealing at 1350 to 1450 degrees Fahr. will not result in quite so much strength drop, but about the same final hardness, 120 to 130 brinell is attained. Heating for appreciable periods at 1250 to 1350 degrees Fahr. will produce even less weakening, usually not much over 10 per cent. Low silicon, low carbon irons anneal less readily than higher silicon, higher carbon metals. Addition of alloys, particularly carbide formers such as chromium, raises the necessary annealing temperature quite materially.

Rabble Blades Must Resist Sulphur

Can you give us any information on the best mixture for gray iron rabble blades that come in contact with sulphur dioxide and sulphur trioxide? The blades are 10 x 6 x 1 inch, and are used in a lead refinery where they come in contact with hot ore containing considerable sulphur.

For a similar purpose in an Australian zinc refinery, it was found that rabbles containing 27 per cent chromium, 0.75 per cent silicon, and 1.50 per cent or less carbon gave the best results. The furnace operating temperature was over 2000 degrees Fahr., and other materials tended to corrode badly at the top surface of the ore. Possibly an alloy iron containing 14 per cent nickel, 6 per cent copper, 4 per cent chromium, 3 per cent carbon, and 1.50 per cent silicon may serve satisfactorily.

If you do not desire to enter into the production of the high alloy materials, but are interested in obtaining a more satisfactory product, it is suggested that you try adding smaller quantities of alloys to your regular mixture. Addition of 0.50 to 0.75 per cent chromium with 1.50 to 1.75 per cent nickel will serve better than plain gray iron. Possibly the addition of about 0.50 per cent chromium alone may give good results. It is suggested that you make a few rabbles of different compositions for test purposes, and then pick out the one giving the most satisfactory service. Be sure and mark the rabbles so that there is no possibility of mistake in identification.

Remedy Is To Mold It Upside Down

We have had trouble with a leather press casting 26 x 51 inches, a chambered table supported on four legs or standards 17½ inches high. We have cast this with the large machined surface in the cope, but the face is dirty and shrink holes appear under the risers. Can we adopt some gating method to prevent these forms of defects.

The logical place to gate this casting is at both ends with gates delivering metal to the bottom of the legs. Auxiliary gates at the joint of the mold and connected to the same sprues will allow fresh hot metal to enter the mold when the legs are filled. However, gating is a comparatively minor factor in this instance. Dirt on the machined face of the casting indicates that the metal did not lie quietly in the mold. In a green sand mold this turbulence may be caused by steam.

The mold was not vented adequately. In a dry sand mold the vent from the cores did not escape as freely and readily as it should through the proper channels. In either case the boiling iron produced a slush compound which floated to the top, was pressed against the cope face and appeared when the machine tool removed the skin. Obviously the remedy is to construct a mold in which the iron will lie perfectly quiet. Shrink holes under the risers indicate that the risers were not large enough for the purpose. The metal solidified in the risers before the metal solidified in the casting.

In this connection it is interesting to note that boiling iron in the mold will nullify the action of the risers to a considerable extent. A highly skilled molder is the only person competent to produce the casting with the machined face in the cope. A second solution of your problem is to mold the casting upside down. This will increase the molding time to some extent, but it will eliminate practically all the hazard and will insure a clean face on the casting.

Special Treatment Prevents Rust

While on a tour of inspection in the United States we visited a stove making plant where the lids of the coal fired ranges are ground and polished, then heated and treated with oil. Up to the present this method has not been practiced in this country, but we are doing some experimenting. Can you tell us to what temperature the lids are raised. We shall appreciate information on any or all features of the process.

The process to which you refer is known as the Bower-Barff process described in complete detail in THE FOUNDRY some years ago. The following brief description may suit your immediate purpose. After the castings are sandblasted they are preheated to about 1050 degrees Fahr. in a closed muffle. A partial vacuum is established in the muffle and steam superheated to a temperature of approximately 750 degrees Fahr. is admitted under about 4 pounds per square inch pressure. It is claimed that the vacuum condition removes a portion of the gases incident to preheating and permits the steam to act freely and equally upon all parts of the castings. After from 4 to 6 hour's treatment the castings are removed from the furnace and dipped into a mixture of linseed oil and a balsam product known as fernaline. Action of the oil changes the dull gray to a black mat surface which proves attractive and resistant to all ordinary rusting even after the stoves have been in continuous service.

Operate Cupola to Get Hot Metal

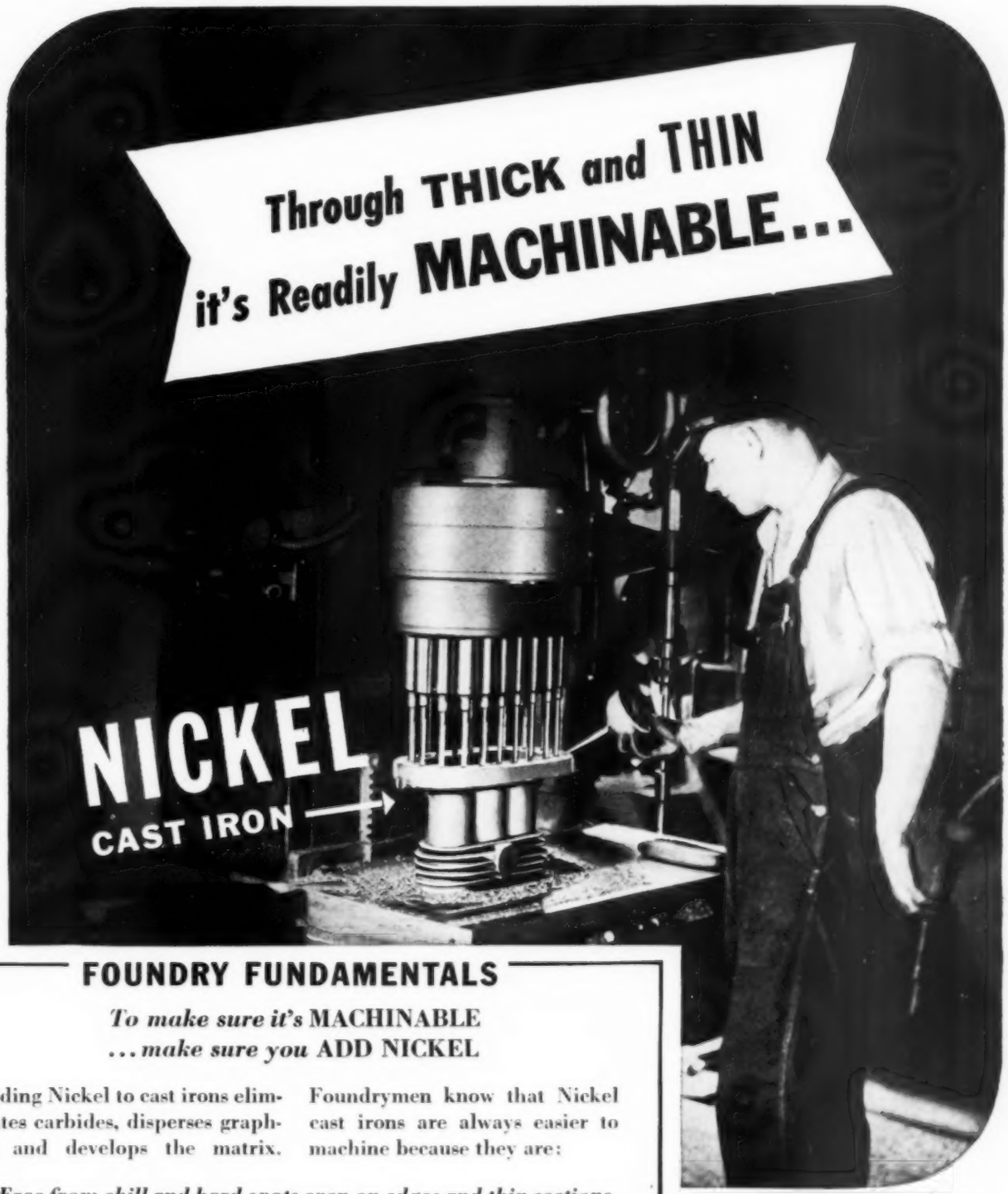
We shall greatly appreciate your advice on cupola operation. We have been tending a cupola for the past 2 years, but recently the iron has been coming cold. What do you suppose is the cause. We charge 1500 pounds of iron and 10 pigs on a bed containing 50 forks of coke. The cupola is lined to 54 inches.

If the cupola has been delivering hot iron for the past 2 years and then commenced melting iron cold a month ago, the obvious inference is that there has been a change in either materials or methods, or both. A careful check over present and past performance should show up the cause of the trouble. Cold iron may be produced in a cupola in which the bed is either too high or too low. Your statement that you place 50 forks of coke on the bed is not sufficient on which to base an opinion, since the fork may be large or small and the coke may vary in weight. Also while 50 forks of coke might be sufficient for a cupola with low tuyers it would not be sufficient for a cupola with high tuyers.

Assuming that the fork holds 25 pounds of coke, the total amount 50 x 25 or 1250 pounds represents the usual height of bed in the average 54-inch diameter cupola, that is approximately 30 inches above the tuyeres. However, since the iron is cold, we suggest as a start that you raise the bed another 6 inches. Even where the bed is the correct height, various other factors may contribute in whole or in part to the production of cold iron. Cold iron at the beginning of the heat may be caused by a low bed, a wet sand bottom, a bed improperly lighted, or burned through only on one side. Later in the heat a drop in the temperature of the iron may be caused by an insufficient amount of coke between the charges and a consequent lowering of the melting zone.

The following brief synopsis may serve in the present instance for your general guidance: Sand bottom with moisture content not over 5 per cent and rammed as in ordinary green sand molding practice. Half the total amount of coke placed on wood kindling and lighted.

After this has burned through the remainder of the coke is added to bring the bed approximately 36 inches above the tuyeres. This height is measured after the bed has burned through and settled down. The iron and coke charges then are placed in the cupola, 2000 pounds of iron and 225 pounds of coke to each charge. To melt the rated capacity of a 54-inch cupola, 23,000 pounds per hour, the blower delivers 4600 cubic feet of air per minute.



FOUNDRY FUNDAMENTALS

To make sure it's **MACHINABLE**
... make sure you **ADD NICKEL**

Adding Nickel to cast irons eliminates carbides, disperses graphite and develops the matrix. Foundrymen know that Nickel cast irons are always easier to machine because they are:

1 ***Free from chill and hard spots even on edges and thin sections.***

2 ***Free from porosity, shrinkage and open grain that cause costly rejects during and after machining.***

3 ***Dependably uniform in hardness and structure through thick and thin sections.***

4 ***Of maximum machinable hardness.***

5 ***Fine grained and mirror-smooth finish.***

Photo courtesy of York Ice Machinery Corp., York, Pa.

Casting cylinder blocks or other patterns with sections of varying thickness, a foundryman's first thought is machinability. From long experience, he depends upon Nickel. Nickel alone or in a balanced combination. He knows Nickel added to cast iron assures increased machinability and uniformity of structure.

• • •

Consultation on prob'ems involving Nickel is invited.

THE INTERNATIONAL NICKEL COMPANY, INC. 67 WALL STREET NEW YORK, N. Y.

MEN of INDUSTRY

L. F. McCONNELL recently has been appointed foundry superintendent, Barnett Iron Works, Palatka, Fla. Mr. McConnell began his apprenticeship in a small foundry in Cedartown, Ga., and finished his apprenticeship at McVay & Walker, Braddock, Pa., and Westinghouse Air Brake Co., Wilmerding, Pa. As a journeyman molder he worked in such shops as the Interstate Foundry Co., and Kilby Mfg. Co., Cleveland; Hooven, Owen & Rentschler Co., and Niles Tool Works, Hamilton, O.; United States Pipe & Foundry Co., and the Bessemer Foundry & Machine Co., Bessemer, Ala. Later he was appointed foreman at the Joubert & Goslin Machinery & Foundry Co., Birmingham, Ala., and then was made superintendent of the special foundry of the United States Pipe & Foundry Co., Birmingham. After leaving their employ, he went with the Trinity Valley Iron & Steel Co., Fort Worth, Tex.

♦ ♦ ♦

HAROLD S. FALK recently has been elected president of the Falk Corp., Milwaukee, succeeding HERMAN W. FALK, who has become chairman of the board. M. A. CARPENTER has been elected secretary and E. P. CONNELL, treasurer of the organization. Harold S. Falk was born in Milwaukee in 1883 and received his education in the schools of that city. He graduated from the College of Engineering, University of Wisconsin in 1906. After he graduated from college he was employed in various departments of the plant until 1920 when he was appointed vice president and works manager, positions which he has held until he became president recently. Mr. Falk is most widely known for the part he has played in the apprenticeship movement throughout the country. Mr. Falk was awarded the John A. Penton gold medal of the American Foundrymen's association at the 1939 Cincinnati convention for his leadership in apprenticeship training.

♦ ♦ ♦

R. C. HARRELL, formerly production control superintendent, Stockham Pipe Fittings Co., Birmingham, Ala., has been made Chicago manager of that organization. Mr. Harrell was born in Nashville, Tenn., and received his education in the Birmingham public schools and at Birmingham Southern and Howard colleges. His education was interrupted by the war when he saw service in the navy. Upon discharge he entered the employ of the Stockham company and has been with that organization continuously since that date. He was superintendent of the gray iron foundry for 11 years until his promotion to the position of production control superintendent. Mr. Harrell has been active in the work of the Birmingham chapter and is the present chairman of that organization.

♦ ♦ ♦

JAMES L. MAHON whose avocation is managing the Detroit branch American Car & Foundry Co., but whose true vocation is politics, philanthrophy and other activities in which the pay is purely sentimental, recently was accorded further recognition by his native city when he was appointed to the fire commission of Detroit by Mayor Jeffries. Two years ago THE FOUNDRY presented a sketch of the genial Jim in his role of No. 1 Newsboy selling papers for the Old Newsboys Goodfellow Fund in which $150,000 was raised to assist Santa Claus in ministering to needy children. Mr. Mahon was born in Detroit, Feb. 7,

(*Concluded on page* 44)

Harold S. Falk

L. F. McConnell

R. C. Harrell

James L. Mahon

Looking Forward to the FUTURE

FOR 57 years, Woodward Iron Company has made nothing else but pig iron. With ore reserves sufficient to operate present furnaces at peak capacity for fully 100 years and practically inexhaustible reserves of fine coking coal, Woodward confidently expects to render at least another century of service to the foundry trade.

Looking forward to the future, Woodward is constantly improving its material equipment and production methods, its most recent betterment being air-conditioning of furnaces to increase uniformity of pig iron output.

Woodward's sales policies also recognize this long range viewpoint. In every district, established agencies are maintained by our company. This arrangement gives to our customers the advantage of long established personnel in each locality, who are familiar with the problems of their customers and the areas they serve. These representatives are not mere "salesmen" in the commonly accepted meaning of that word. They are equipped by training and practical experience to understand the problems of the foundrymen. Their efficiency is rated—not on order booking but on their ability to win and merit the confidence of customers.

Woodward Iron invites your business on the strength of its ability to give you now—and in the future—uniform iron and outstanding service.

WOODWARD IRON COMPANY

WOODWARD, ALA.

America's Largest Completely Integrated and Entirely Independent Merchant Iron Producer

INDEPENDENT SINCE 1883

(*Concluded from page* 42)

1881, and entered the employ of the American Car & Foundry Co., Sept. 26, 1898. He filled in succession the posts of car clerk, superintendent clerk, storekeeper, special traveling representative. He was appointed superintendent July 14, 1912. Always active in the Detroit Foundrymens association he was chairman of the ladies entertainment committee September, 1926, when the A.F.A. staged the international foundry convention in Detroit. In May, 1930, he was elected president of the Detroit Foundrymen's association.

• • •

M. T. MORTENSEN recently was placed in charge of the Detroit district sales office of the American Foundry Equipment Co., Mishawaka, Ind., filling the post vacated by the death of Hutton H. Haley. Mr. Mortensen received his early education at Manistee, Mich., and completed his apprenticeship in electrical work there in 1906. He then became chief electrician for the Michigan State hospital at Traverse City, Mich. In 1910 he was appointed works engineer of the Michigan Steel Casting Co., Detroit, and continued with that firm until 1919. During that period, however, he was associated temporarily with J. J. Wilson, who then was in charge of all General Motors foundries. Mr. Mortensen spent considerable time with Mr. Wilson during the period when the Chevrolet foundry at Saginaw and the Buick foundry No. 20 at Flint were being built. In 1919 he was associated with the Aluminum Co. of America as works engineer and in the fall of that year he joined the foundry equipment department of J. W. Dopp & Co., Detroit, later becoming vice president. In 1923 he became representative of the W. W. Sly Mfg. Co., Cleveland, in the Detroit territory, and remained in that capacity until January, 1939. During the past year he has been connected with the Schmieg Sheet Metal Works, Detroit.

M. T. Mortensen

• • •

BENJAMIN P. MOFFATT recently was appointed manager of the New York district, Hewitt Rubber Corp., Buffalo.

• • •

J. C. MERWIN recently was elected treasurer in addition to his office of vice president of the Chain Belt Co., Milwaukee. L. B. MCKNIGHT has been appointed assistant to the vice president.

• • •

H. H. BLOSJO, metallurgist, Minneapolis Electric Steel Castings Co., Minneapolis, will speak before the Northwest chapter of the American Society for Metals when that group visits the plant of the company on April 11.

• • •

JOSEPH E. WHELAN has been promoted to secretary, WALTER E. SPENCER to treasurer and assistant secretary, and MAURICE J. QUINN to assistant treasurer of Continental Roll & Steel Fountry Co., East Chicago, Ind.

• • •

EDWARD J. LEISER has retired as superintendent, Milwaukee works of the International Harvester Co., after 35 years' continuous service with the company. He served successively as chief clerk in the order department, production manager, foundry manager, assistant superintendent and superintendent. JOHN E. HARRIS, for the past 5 years assistant superintendent of the company's Chicago tractor works, succeeds Mr. Leiser as superintendent of the Milwaukee works.

• • •

V. A. CROSBY, metallurgical engineering, Climax Molybdenum Co., Detroit, has been appointed chairman of American Society for Testing Materials subcommittee XI on methods of testing. O. B. SCHULTZ, chemist and engineer of tests, Lima Locomotive Works, Inc., Lima, O., has been appointed chairman of subcommittee III on cylinders, and G. F. COMSTOCK, metallurgist, Titanium Alloy Mfg. Co., Niagara Falls, N. Y., chairman of subcommittee VII on microstructure.

• • •

Norton Co., Worcester, Mass., has made several changes in its sales organization as follows: P. S. WISWELL, who formerly has been looking after interests of both the Norton Co. and its Behr-Manning division, will devote all his time to the sale of Behr-Manning products. WARREN H. TURNER, field engineer for the Norton Co. in the Detroit area, will take over the southern California territory including Arizona and New Mexico with headquarters in Los Angeles. E. G. PETHERICK, formerly grinding wheel specialist for C. W. MARWEDEL, Norton distributor in San Francisco, has joined Norton and will take over the northern California district including Nevada and Utah. A. M. PITTS, with headquarters in Seattle, will continue as representative in Washington, Oregon, Idaho, Montana and western Wyoming.

• • •

D. M. CURRY has become affiliated with the technical service staff of H. Kramer & Co., Chicago. Previously Mr. Curry spent 11 years as assistant foundry superintendent, Ford Motor Co., Detroit, 7 years as foundry superintendent, Federal-Mogul Corp., Detroit, and for the past 5 years was connected with the Development and Research department, International Nickel Co., Detroit.

D. M. Curry

• • •

FRED GRONDIE for the past 23 years foundry superintendent Kilby Mfg. Co., Cleveland, resigned that position recently to accept a similar post with the City Foundry Co., where he succeeds the late Jefferson C. Weisenbach. Mr. Grondie was born in River Rouge, Mich., several years before the Ford Motor Co., established the present immense plant and familiarized the name to millions of people all over the world. He grew up in Lorain, O., and served an apprenticeship in the foundry of the National Tube Co. Later, after the custom of young journeymen of the period, he worked in several foundries in the Middle West and in Canada. He was employed by the Kilby Mfg. Co., in 1906, promoted to the position of assistant superintendent a few years later and to the position of superintendent in 1917. As a producer of large and intricate gray iron castings for a wide variety of uses and particularly for use in the sugar and chemical industries the Kilby company has enjoyed a high reputation for over 60 years.

INTERVIEW
WITH A PILE OF BLACK SAND

1.

The boss was just talking to a truckman, so I guess I get the gate.

2.

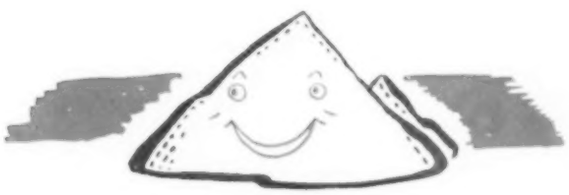
Nope, looks like I'm in again! Here comes new sand and Truline Binder to put me back on the job.

3.

Watch me save the boss some cash, teaming up with that low-cost Truline Binder and new sand. I'll make swell castings, too.

4.

This is the life! Come on, you hot metal, I can take it. Truline makes me as good as new.



5.

Look at that casting . . . smooth, clean, and without a crack. I hardly felt the metal shrink, the way Truline burnt out and let me collapse.

6. Well, here I am at the old dump. I lost some weight in the reclaimer, but thanks to Truline I'll mix into a lot more good cores. Thanks, boss, you did a good job for both of us.

TRULINE BINDER

Reg. U. S. Pat. Off. by Hercules Powder Company

CAN BE USED WHEREVER METALS ARE CAST

HERCULES NAVAL STORES

HERCULES POWDER COMPANY

Incorporated

999 Market Street, Wilmington, Delaware

BRANCH OFFICES: Chicago New York St. Louis San Francisco Salt Lake City

JJ-29

There's a lot of truth in this little interview. Foundrymen everywhere have learned the merits of Truline Binder. It is being used in ever-increasing quantities in steel, gray iron, malleable iron, and nonferrous foundries to save money and time, and to get better castings. Ask about Truline Binder for cores, and as a core wash, too.

We'll be at the Foundry Show—Booth 56. Look us up.

FOUNDRY DEVELOPMENTS AT SHORT RANGE

A RECENT development in England is an aluminum alloy melting furnace in which the heating is performed by internally-fired radiant tubes immersed in the metal bath. It is claimed that a furnace, with a holding capacity of 1120 pounds, has an output of 672 pounds per hour, and overall figures for consumption of Town's (artificial-about 630 b.t.u.) gas of under 2 cubic feet per pound of aluminum melted.

* * *

Collapsibility of a core may be increased by raising its permeability. As the permeability increases, a greater quantity of heat flows through the core causing early breakdown, provided other conditions are favorable.

* * *

A diesel engine bed weighing over 10,000 pounds with sections varying from $\frac{3}{4}$-inch in the webs to 4½ and 5 inches in chunky bearings was made from a composition containing 2.86 per cent total carbon, 2.26 per cent silicon, 0.76 per cent manganese, 1.63 per cent nickel, 0.90 per cent molybdenum, and 0.31 per cent chromium.

* * *

GOGGLES after having been worn by one employe should be sterilized before being reissued to another. Also goggles used by one person continuously should be sterilized at regular intervals. Before sterilization the goggles should be scrubbed with soap and water. Sterilization methods recommended by the National Safety council code are: Immersion in boiling water for 5 minutes; immersion in live steam for not less than 5 minutes, or immersion for 10 minutes in a solution made by mixing one part 40 per cent formaldehyde with 9 parts of water. If certain parts of the goggles will deteriorate due to such treatments, they may be sterilized in a moist atmosphere of formaldehyde for 10 minutes at room temperature.

* * *

To control the carbon content of cupola irons it is necessary to have a suitable charge, a suitable coke, and proper melting and tapping technique. Hard dense, high ash cokes are less soluble than soft, open, low ash cokes, and give a product from 0.50 to 0.75 per cent lower in carbon. Metal not allowed to accumulate in the cupola well probably will be 0.15 to 0.20 per cent lower in carbon than otherwise, and when melting rate is fast the carbon will be 0.15 to 0.20 per cent lower in carbon than when melted slow.

* * *

INSULATING material placed between the shell of a furnace and the refractory material prevents heat from escaping and puts it to active use. Hence, the heat input should be such that the refractory does not get too hot with resultant shortened life. The practical thing to do is to supply just enough heat to bring the refractory to the same temperature obtained without insulation which results in the same life for the refractory with a lower fuel cost.

* * *

Lights and motors in the foundry should not be operated from the same circuit since the varying load on the motors cause fluctuations in the line voltage which may shorten lamp life seriously, and may prove a source of annoyance due to flickering lamps. Overvoltage decreases lamp life considerably as shown by 115-volt lamps on 120-volt circuit which resulted in an average of 55 per cent of normal.

* * *

Lead is the chief impurity in manganese bronze. In large castings or in castings that are likely to be highly stressed, it is recommended that a maximum of 0.20 per cent lead be permissible. There is no question but that lead has a deleterious effect on mechanical properties; shock resistance in particular. For castings unlikely to meet severe stresses, an upper limit of 0.40 per cent lead is not excessive.

* * *

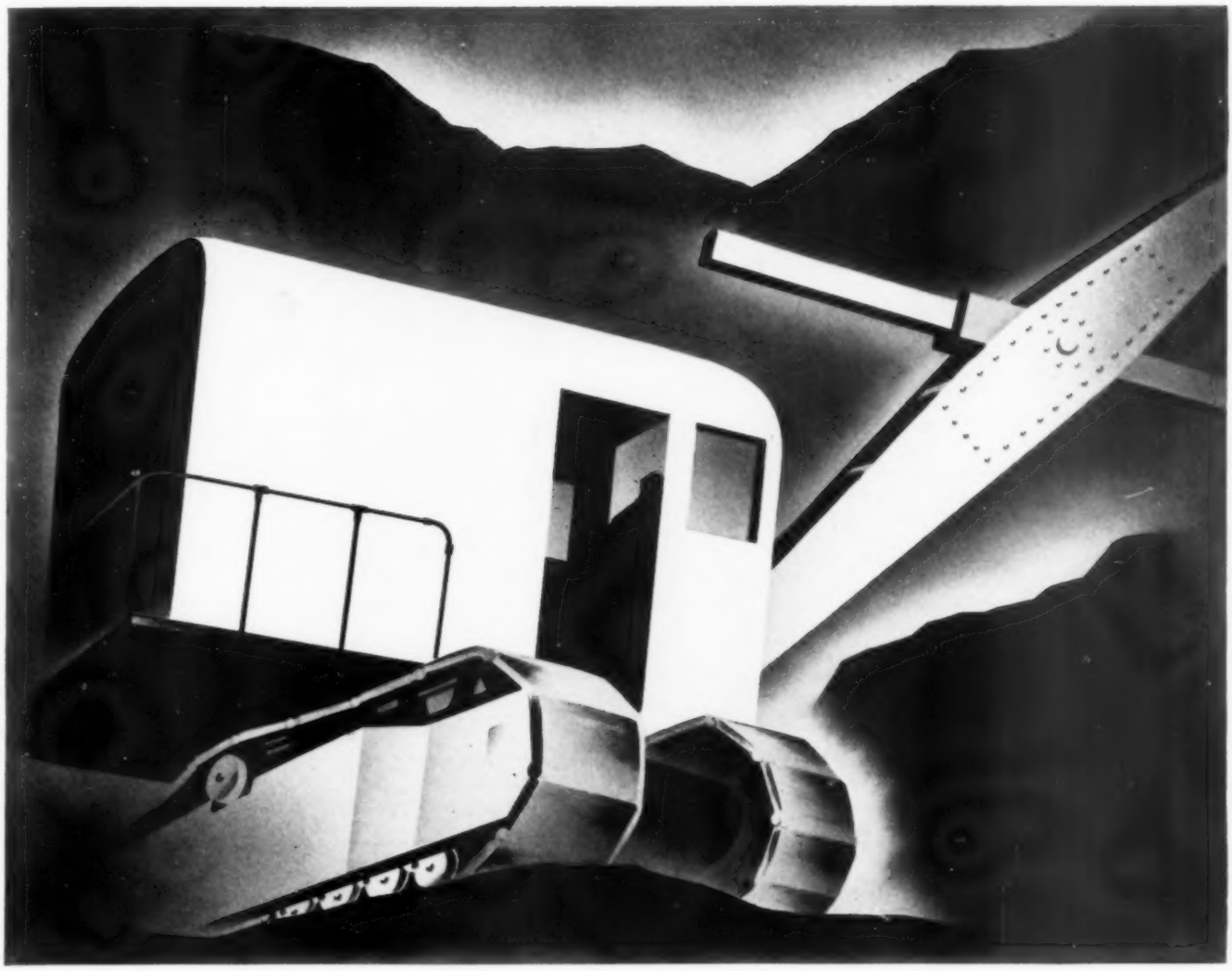
Hot strength of molding sand between 500 to 2000 degrees Fahr. increases with an increase in moisture content. In other words heavy tempered sand will cause more hot cracks and strains, and will shake out harder than a medium or light tempered sand.

* * *

Surface shrinkage in aluminum alloys, or chicken tracks as it is termed by some foundrymen, is quite disconcerting, and may result from too high a pouring temperature. It has been pointed out that on a certain type of casting where difficulty was encountered in running the job, an increase of 25 degrees Fahr. made it possible to run the casting, but led to surface shrinkage.

* * *

TO PROVIDE a combination of high strength with high heat resistance in grate bars, one foundry has developed a process whereby the lower part of the mold is filled with steel, and after a definite time heat resistant, alloy iron is poured in to fill the remainder of the cavity. The procedure is said to result in practically perfect fusion between the two.



STAMINA TO SPARE

When it comes to power shovels, "heavy duty" means just what it says. They must have stamina to spare. And that is the reason a leading shovel manufacturer has adopted Molybdenum steels for many vital parts.

Driving clutches, swing drum bevel gears and shipper shaft pinions, for example, are made of Manganese-Molybdenum cast steel, chosen because: it develops the requisite toughness and hardness; it responds readily to various heat treatments to produce different physical properties to meet various requirements; it is comparatively inexpensive.

If you are casting steel for any purposes you should have a copy of our technical book, "Molybdenum in Steel," which gives complete practical data on Manganese-Moly and other Molybdenum cast steels. It is sent free on request to engineers and production executives interested in modern materials for modern needs.

PRODUCERS OF MOLYBDENUM BRIQUETTES, FERRO-MOLYBDENUM, AND CALCIUM MOLYBDATE

Climax Mo-lyb-den-um Company
500 Fifth Avenue · New York City

MOLY

THE ADVENTURES OF BILL

By PAT DWYER

Drawings By RICHEY

IN A RANDOM discussion of wars the other night, past wars, present wars and without a doubt, future wars, Bill referred to several statements which appeared in a recent magazine article dealing with the military relations existing between the United States and Canada. He did not remember the name of the author, the title of the article, the particular magazine in which it appeared or the approximate date on which he had read the story.

"What's the difference who wrote it?" He dismissed the objection briefly. "A name is just a name and an author smells either sweet or sour as well by one name as by another. Seems to me our old friend Willie Shakespeare settled that point many years ago when he had something to say about a rose by any other name and all that there kind of stuff.

"A habit formed in the days when a headline or title bore a rather close relationship to the subject matter of an article, leads me to read modern titles and headlines, but I make no attempt to remember them afterward when I find that apparently they are supplied by mysterious individuals in the background who pick 'em out of a hat or a grab bag. Occasionally the title contains a hint or a clue, but I think that is merely a coincidence and is not to be taken as evidence that the author of the headline or title had read the article or had even a vague knowledge of the subject.

"As for the magazine in which the story appeared, I probably never shall see it again, so why should I attempt to keep it in mind? Talking about time or dates always brings Harry Lauder to mind in the prologue to one of his songs wherein he meets the late Sir Ernest Shackleton. 'Ah dashed into a pub,' says brave Harry. 'A pub Ah'm in the habit of dashin' into whenever Ah'm extra dry or for that matter, any other time. It may have been 11 o'clock or half past or a quarter to 12. Ah don't know what time it was, but it was near-r-r the end o' the week anyway.' (Twirl of the crooked stick)

"Well, I'm in the same boat. I don't remember when I read this article about the harmonious relations existing between the two countries but it was at or about the time the new year came into existence. You could pester me with questions all night without getting any closer than that to the bull's eye."

"If you want to drag a bull into the thing," I said, "the session is over. Really, one must draw the line some place, must one not? As a plain matter of fact I do not need to ask you any questions. I read the same article you read based on the good old slogan: 'Three thousand miles of border and a hundred years of peace. Remarkable is it not? Three thousand miles of border line and not a fortification, a cannon, or an armed guard from one end to the other. A thousand miles of border line through the Great Lakes and not an armed vessel patrolling the waters. Veterans of foreign wars fraternize on both sides of the line on public occasions and the flags of the two nations are carried in the parades, but for over 100 years no armed force has crossed the boundary line or set foot on adjoining territory with hostile intent."

How about yohoho and a bottlarum?

"Reminds me," said Bill, "of how I was tangled up to some mild extent a few years ago in Erie, Pa., in a relic of hostile intent, a souvenir of the last great fight on the lakes before this here now 100 years peace plan and 3000-mile silent and peaceful border line was established. Presumably you are familiar with the history of Commodore Oliver Hazard Perry, his battle with and victory over the British fleet in Lake Erie, his famous message to congress 'We have met the enemy and he is ours,' and his triumphal return to Erie in his shot-riddled brig NIAGARA. All these items are more or less common knowledge, but subsequent history and ultimate fate of the old NIAGARA is not so well known. Stray items on the subject I had picked up here and there were assembled in my mind in a rather disjointed and hazy pattern. When I left Erie on this particular occasion I had learned more about the NIAGARA than if I actually helped to build her, or had helped to ram powder and ball into the cast iron cannon that barked so wickedly through the port holes.

"My education began, innocently enough, when I walked down one night to the covered dock at the lake end of State street. In a space at the land end of the dock I noted about a dozen cast iron guns of the type used afloat and ashore during the stormy period between 1776 and 1812. Natural foundry curiosity led me to examine the guns closely. To use a recent popular phrase they were not guns, but reasonable facsimiles thereof. The outside contour was that of a gun, but a peep into the muzzle end showed the inside contour followed that of the outside. Instead of a straight bore, the cavity gradually increased in size from muzzle to breech and the thickness of metal was approximately one inch, just about the same as a piece of water pipe.

"What Ho," says I to myself, "what goes on here? It is perchance there is a colored individual lying perdu or in other words concealed

(*Continued on page* 50)

POPULAR TWINS

and justly so!

The increasing popularity of these Federal "twins" is not accidental. When two products like these become more popular year after year, there can be only one reason: *They produce better castings.*

The production of better castings in the foundry has always been our constant endeavor. Years of research, in both our laboratory and in the foundry, established facts about seacoal and bonding clays which were unknown before. Knowledge of these facts made it possible for us to produce these unusually efficient "twins".

Continuous research is *our* assurance that the "twins" will continue to grow in popularity—it is *your* assurance of complete satisfaction when you use them.

CHARLEROI SEACOAL

Many foundries have reported saving up to 20% of their seacoal costs after switching to "Charleroi". Here's why it is to be expected.

Charleroi Seacoal is made from the highest grade of Pennsylvania lump gas coal. All of its good qualities are retained in grinding because we use slow-speed, frictionless grinders. Each of the seven grades of "Charleroi" is accurately screened to match grain size of the sand in which it is to be used.

It is economical because less is required to do the job correctly. Get in on the savings—use Charleroi Seacoal.

FEDERAL GREEN BOND...

Federal Green Bond is the ideal bonding material for all foundries.

It develops the proper dry strength to prevent cuts and washes in your castings. Federal Green Bond is the most durable bonding agent known—less is required to maintain proper sand strength, heat after heat. Its stability is another outstanding quality—errors in moisture content do not radically affect its bonding strength.

Federal Green Bond is laboratory-controlled from mine to bag—it is always uniform, always stable. Why not try it in your foundry?

Licensed for foundry use under U. S. Pat. Nos. 1657573, 1509406, 1509478, and Canada Pat. Nos. 249251, 249252.

The FEDERAL FOUNDRY SUPPLY COMPANY

4600 East 71st Street • Cleveland, Ohio

CHICAGO CHARLEROI, PA. DETROIT MILWAUKEE MINNEAPOLIS NEW YORK ST. LOUIS RICHMOND, VA. UPTON, WYO.

(*Continued from page* 48)

in the stack of cord wood?" Cannon, either genuine or reasonable facsimiles thereof, do not sprout out of the ground like mushrooms. Idle curiosity prompted the idea that practically any person in the town could tell me who made them, where they were made and for what purpose they were intended. Apparently I overestimated the general knowledge rating of a few honest citizens loitering in the vicinity. The first one said he 'Didn't know nothin' about 'em.' The second said he never remembered seeing the things before. The third man said he often had wondered about the pile of junk, but he figured it wasn't none of his business, see, and he hadn't never bothered asking nobody no questions about 'em."

"Then I suppose," I said, "you took a reef in the old nosey nose. Gave up the entire project and spent the remainder of the night tossing from side to side of the best bed in the Lawrence vainly seeking a solution of the mystery."

"On the official score card," said Bill, "if we had a score card, your reply would appear between WRONG and POSITIVELY. I lost no sleep either on that or any other night. Next day in conversation with a young foundryman I brought the subject up casually. He had a vague idea the cannon were connected in some way with the NIAGARA, but he could offer no information on when, where, how or by whom they were cast.

"In the public library I outlined what I wanted to a lady assistant with a pair of the most sparkling and attractive brown eyes—reminded me of a girl I knew one time—"

"As you were!" I reminded him coldly. "Bring up the lavender and old lace and strolling alone in the moonlight some other time. Eyes are just eyes to me. Carry on with the phoney cannon. Don't tell me they were cast in her papa's shop when she was a little girl in high boots and pink pinafore."

"No such luck," Bill admitted. "As a matter of fact she knew nothing about the old guns down on the dock but she placed at my disposal about a dozen books dealing in one way or another with the history of the NIAGARA. Only one item was omitted. Not a single reference could I find to the stack of cannon I had discovered. The lady had two strings to her bow. She may have had two beaus to her string, but that is neither here nor there. Just chucked the observation in for good measure. She suggested that I should call on a certain prominent citizen who had taken an active part in the program when the NIAGARA as dredged from the bottom of the harbor, reconditioned and taken for a triumphal tour of the Great Lakes in 1913. The centennial, in case you have forgotten, of Comrade Perry's exploit. I had the feeling one has after the last weight is placed on the mold, the crane brings up the ladle and the old man says, 'All right, boys. Let 'er go!' The information was as good as in the bag."

"The cannon were cast over in Ireland with metal from that blast furnace Comrade F. (Firebrick) McCarthy was telling you about one time. They were deliberately designed to fall into the hands of the enemy where they would cause deep distress, chagrin, annoyance and humiliation by bursting at the first discharge. The local committee got in a jam over the freight, according to the ruling of the Continental congress. The teamsters staged a strike. The stevedores refused to handle the guns without a union label and—well, there y'are!"

"If I had not heard you with my own ears, I would not consider it possible for any male person over the age of seven to stray so far from the truth. I have not the time to take up each of the items separately, but I can boil the combination of answers down to the single word NO.

"The friendly and chatty old gent was the chairman and active spirit of a committee which had wangled an appropriation from the state legislature to celebrate the centennial. With the greatest of ease he quoted names, dates and financial details, but when I pinned him down to the cannon he confessed he did not remember who made them, nor where they were made. However, he had one last shot in the locker, and that did the trick. He gave me the name and address of Captain Morrison. 'The Captain,' he told me, 'supervised the reconditioning of the NIAGARA and then was in command of the steamer which towed her all around the lakes. He can tell you anything you want to know.' 'Bingo,' says I 'here's where I hit the jack pot.'

"The instant I clapped my peepers on the retired master mariner I knew that my search was over. Still strong and robust, he radiated an air of authority, competence and reliability, invariably acquired by men accustomed to assume responsibility, to maintain discipline and to administer the high justice, the middle and the low according to their own interpretation—"

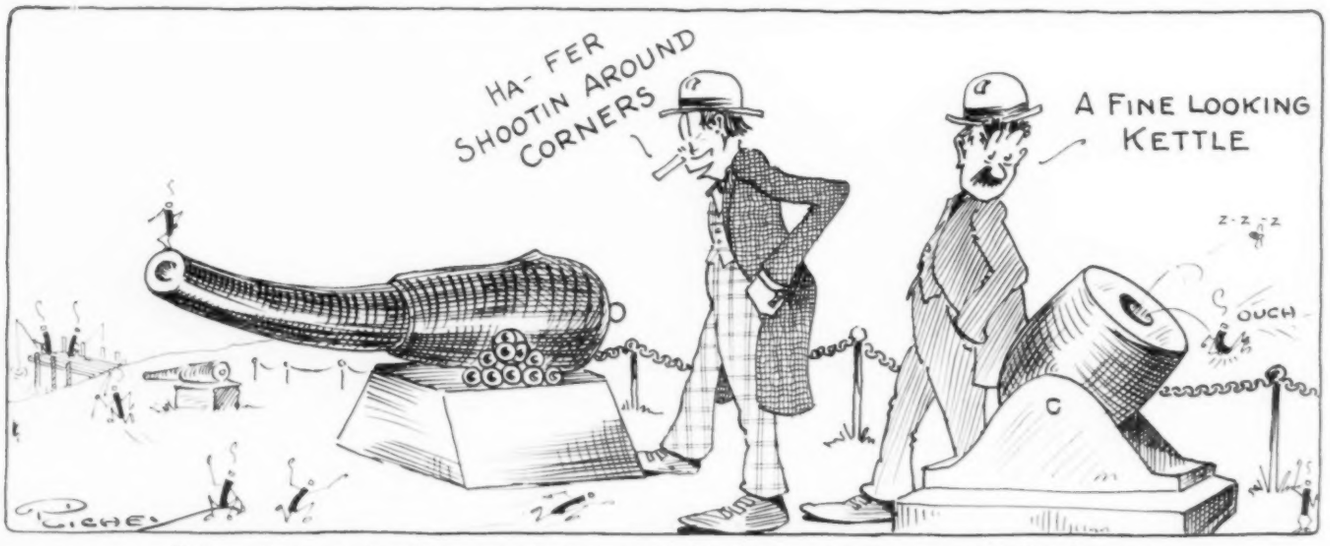
"Just like an old-time foundry gaffer."

"Well, yes. They also knew exactly what to do in any kind of an emergency. I remember one time—"

"What about the cannon?"

"While reconditioning the NIAGARA for the centennial cruise the captain decided to lighten her as much as possible. He made the drawings for the thin wall cannon and had the pattern and castings made in

(*Concluded on page* 91)



Ball used repeatedly. Flies in circle and returns like homing pigeon. Angus McTavish patent

Cope moulds are produced on No. 818 type Osborn Machines (stationed at left of roller conveyor).
Drag moulds are produced on No. 333 type Osborn Machines (stationed at right of conveyor).

Faster Production
OF HIGH QUALITY MOULDS AT LOW COST PER MOULD

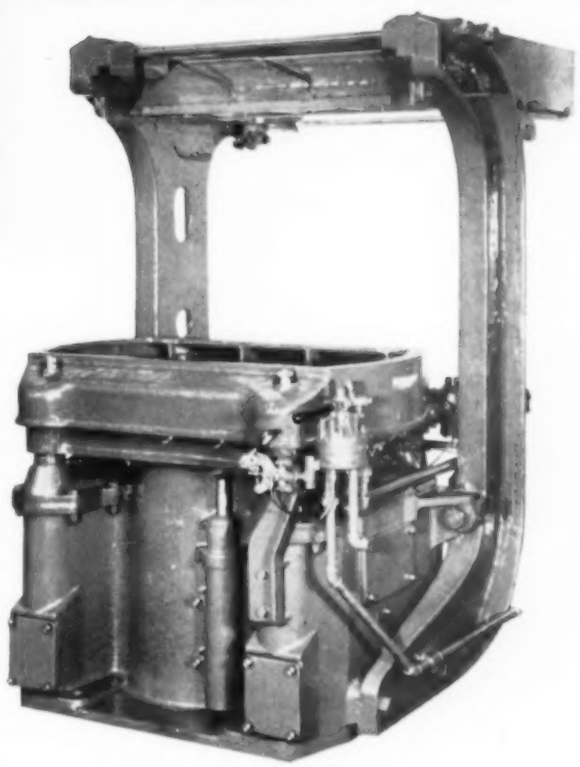
● In the foundry illustrated, continuous, high speed production of high quality moulds is accomplished by a battery of No. 818 type Osborn Jolt Squeeze Strippers operating in pairs with a battery of No. 333 type Osborn Jolt Rollover Squeeze Pattern Draw Machines.

Rate of production is more than a mould per minute per machine.

No. 818 Machines produce cope moulds in coordination with No. 333 Machines (on opposite side of conveyor), thereby maintaining a constant flow of uniformly high quality moulds at maximum speed of production.

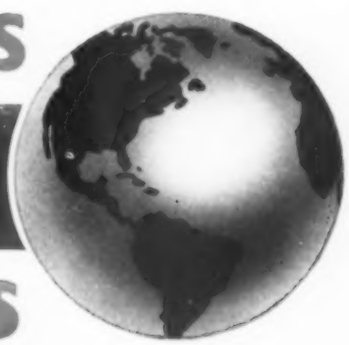
Osborn engineers will cooperate with YOU to accomplish the most practical application of Osborn Moulding Machines to meet YOUR particular requirements. Write to:

THE OSBORN MANUFACTURING COMPANY
5401 HAMILTON AVENUE • CLEVELAND, OHIO, U. S. A.
Agencies located strategically all over the world



No. 818 type Osborn Jolt Squeeze Stripper

TIME PROVES VALUES



OSBORN
MOULDING MACHINES

ADVERTISING PAGES REMOVED

Wisconsin HOLDS THIRD REGIONAL

AN INTERESTING and extensive program brought approximately 500 foundrymen to the third annual regional foundry conference at the Schroeder hotel, Milwaukee, Feb. 15 and 16, sponsored by the Wisconsin chapter of the A.F.A. and the department of mining and metallurgy college of engineering, University of Wisconsin, Madison, Wis. Prof. E. R. Shorey, chairman of this department of the university served as co-chairman of the foundry conference with B. D. Claffey, manager gray iron division and Werra Aluminum division, General Malleable Corp., Waukesha, Wis. Opening address of welcome was delivered by F. Ellis Johnson, dean, college of engineering, University of Wisconsin.

By adhering closely to a definite time schedule, four technical sessions were conducted simultaneously each day, the first from 9 to 10:15, the second from 10:30 to 12 noon, the third from 1:30 to 3:20 and the fourth from 3:30 to 5 p. m. Entertainment and relaxation were provided at a luncheon and dinner Thursday and at a noon luncheon Friday. The technical program was laid out in accordance with the four main divisions of the foundry: Gray iron, malleable iron, steel and nonferrous metals.

Additional features were provided at the first noon luncheon when Phil S. Hanna, editor, Chicago *Journal of Commerce*, discussed present day affairs. At the joint meeting, Thursday afternoon, Franz A. Kartak, dean, college of engineering, Marquette University, Milwaukee, set forth his views on training tomorrow's foundrymen. At the Thursday dinner meeting John C. Metcalf, former special agent in charge Nazi and Facist investigations, Dies committee on unAmerican activities, related some of his experiences in exposing these movements. A masterly and inspirational address on the connection between education and business was presented at the Friday luncheon meeting by Clarence A. Dykstra, president, University of Wisconsin.

The first paper on the technical program under the chairmanship of H. Waldron, Nordberg Mfg. Co., was presented by B. P. Mulcahy, Citizens Gas & Coke Utility, Indianapolis, and covered the subject of foundry coke as a raw material and a fuel. In properly evaluating the features and characteristics of foundry coke as they relate to cupola operation, the speaker claimed full consideration must be given

(*Continued on page* 55)

Views at Wisconsin meeting through courtesy of John Bing, A. P. Green Fire Brick Co., Milwaukee

(*Continued from page* 52)

to the influence of the coke upon the process and in turn the influence of the process upon the coke. Although the function of coke generally is regarded as the fuel for the process, it also should be regarded in the light of the raw material, because of its influence on the carbon, silicon and manganese in the final iron.

Giving full consideration to the fact that there are three principal raw materials entering the cupola, iron, coke and air, the speaker stated that the interdependence of the three materials is illustrated by the limiting and the governing features of each. With the industry demanding higher strength irons it becomes increasingly important that all three raw materials be measured accurately and the quality of each assayed accurately. For example, air often passes through the cupola in volume almost equal to the weight of the iron. The only evidence of the quantity is a plain *U*-gage. The raw material may be so poor that the cupola, irrespective of operating technique, cannot produce sound iron. Coke is added at the whim of an individual workman. Necessity for closer control has come with the advent of better iron, particularly with respect to the carbon content. Full recognition must be accorded the fact that during the process of cupola melting, carbon is added to and taken away from the metal. Final carbon content depends not only on the coke, but on the operation. On the subject of coke size the speaker pointed out that material changes in the carbon content of the final iron can be effected by use of different size cokes and properly balancing other features.

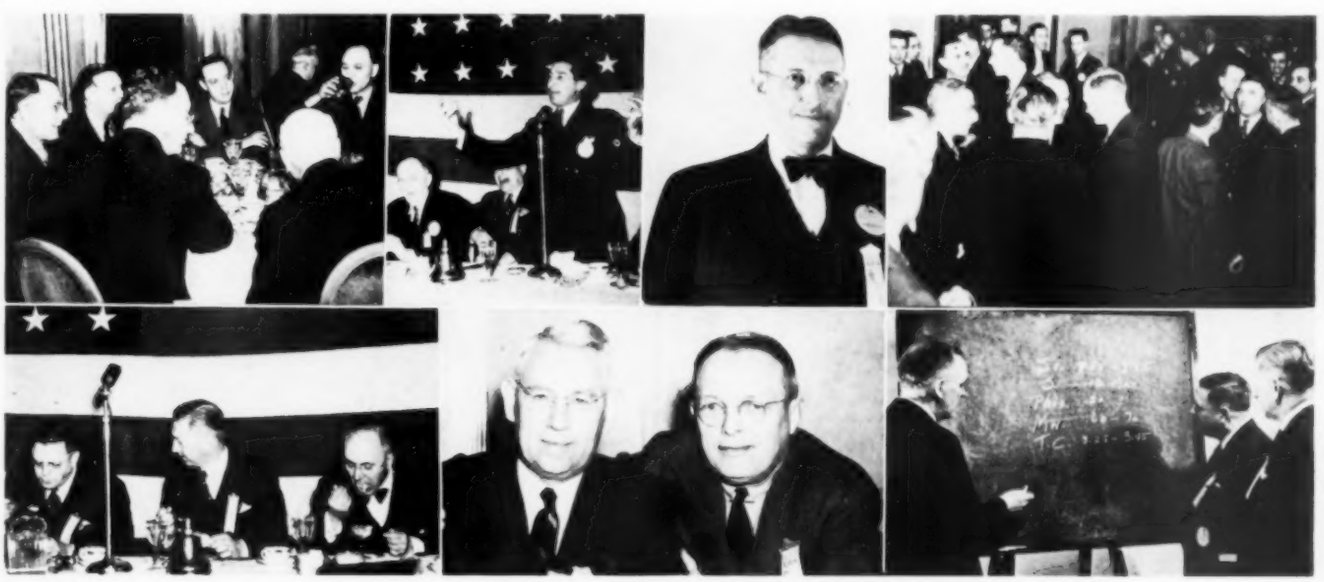
At the afternoon iron session, under the chairmanship of William Hambley, Allis-Chalmers Mfg. Co., West Allis, Wis., Elmer J. Carmody, C. C. Kawin Co., Chicago, conducted a sand clinic designed primarily to show to what extent the condition of sand is responsible for satisfactory and unsatisfactory castings. Fortunately in recent years through the efforts of the A.F.A. and the work of private investigators a definite system has been established for evaluating properly sand according to basic characteristics, grain size, clay content, permeability, refractoriness, green and dry strength, flowability, moisture content. Suitable apparatus has been developed for gaging these features so that investigation of problems whether from cause to effect, or from effect to cause can be carried on intelligently. The speaker considered each feature in turn and then showed how a variation between minimum and maximum limits affected the general combination.

Copper Affects Physical Properties

Friday morning under the chairmanship of William Hambley, Allis-Chalmers Mfg. Co., West Allis, Wis., a paper on "Copper As an Alloy Element in Cast Iron" was presented by Tom Barlow, Copper, Iron and Steel Development association, Cleveland. A number of slides illustrated effect of copper additions on chemical and physical properties of cast iron, as compared with effects of other alloy additions. According to the speaker copper belongs to the group of chill reducers or mild graphitizers. It differs from silicon in that it reduces chill in light sections but does not increase softness or porosity of the adjoining heavy sections. Usually addition of copper increases the tensile strength from 2000 to 10,000 pounds per square inch, according to the speaker, and apparently a corresponding increase in transverse strength and brinell hardness brings no loss of machinability. Combination alloy irons frequently are machined at a brinell hardness of 300. Following a detailed reference to the use of copper in a wide variety of castings the speaker described recommended practice for adding the copper to the iron. Shot in the spout or ladle is preferred for light castings, but the copper in larger pieces may be added to the charge in the cupola. He warned against the use of copper scrap which may contain harmful elements. Up to 2.5 to 3.5 per cent he claimed there is no tendency for copper to separate out or segregate in one spot.

Characteristics Not Transmitted

Effects of the usual elements in gray iron were described by John Tissing, C. C. Kawin Co., Chicago, at the second gray iron session Friday, with H. Waldron, Nordberg Mfg. Co., in the chair. He pointed out that proper use of alloys and care in temperature control has a measurable effect on the matrix as well as size, pattern and type of distribution of the graphite. Somewhat popular belief that inherent characteristics carry over from the blast furnace and reappear in castings, is not invariably true. Silicon decomposes iron carbide and is a softening element except when present in extra high percentage. Manganese and sulphur should be considered together since the manganese controls or neutralizes the hardening effect of the sulphur. Under ordinary conditions the manganese content should not be less than 0.50 per cent. Phosphorus increases fluidity, but on account of less desirable attributes, it is preferable to increase the fluidity by raising the temperature. The speaker presented a case history of a



Candid shots taken during the Wisconsin regional. Photographs courtesy John Bing, A. P. Green Firebrick Co., Milwaukee

wide range of test bars poured from the same base mixture, but containing varying amounts of various alloys, copper, nickel, chromium, molybdenum. He admitted that different results might have been secured with iron containing higher or lower carbon, or if the alloys had been melted in the cupola with the remainder of the charge. Test bars outlined were poured from a ladle in which the alloys were added to the metal.

"Graphite Distribution and Effect" was discussed at the same session by Prof. Phillip C. Rosenthal, University of Wisconsin, Madison. As might be expected from the professor's general background and experience, the paper was an able, accurate and scholarly treatment of a subject that does not lend itself readily to the ordinary working foundry vocabulary. Unfortunately, limitation of space does not permit of more than a brief reference.

Explains Graphite Distribution

The speaker quoted Boyles (*Transactions*, A.F.A., 1938) to the effect that the mechanism of solidification of hypoeutectic irons can be visualized as taking place in two parts. First as the freezing temperature is reached, crystals of iron containing a certain amount of dissolved carbon start to form in the melt as tree-like growths which branch out in the most favorable directions. This continues until the temperature reaches that corresponding to the eutectic composition. Here a new process of solidification takes place in the remaining liquid. Instead of the tree-like or dendritic growth, the solidification starts at centers or nuclei and progresses outwardly in all directions until the liquid is used up or growth is restricted by other cells growing in the same manner.

Graphite forms during this second solidification period from the excess carbon in the liquid and tends to grow radially from the crystallization centers of the eutectic cells. However, the graphite particle size and distribution are determined, not only by the process taking place in the second period, but also by the results of the first period. Since there are dendrites already present from the first freezing mechanism, the graphite flakes are restricted to the interstices between the branches of the dendrites. Thus the final graphite structure is influenced by the size, shape and relative amounts of the original dendritic structure as well as by the number and manner of decomposition of the eutectic cells produced in the second part of the solidification.

Classifies Iron Into Groups

With this as a background the speaker correlated the various graphite structures with the types of iron in which they are most commonly found. Classed as *A*, *B*, *C*, *D* and *E*, type *A* may be described as a random orientation of flakes uniformly distributed in the matrix. Type *B* shows a random orientation of flakes grouped in rosettes or whorls. Type *C* sometimes shows flakes in random orientation grouped in a dendritic arrangement. The flakes are isolated in regions surrounding the original dendrites of the metal. Type *D*, the fourth type of graphite distribution, is characteristic of hypereutectic irons. It consists of two distinct sizes of flakes. Larger flakes are the result of graphite precipitation directly from the melt. Smaller flakes are formed during the eutectic solidification. A structure related to type *C* is shown in type *E*. This type is found in irons of rather low carbon content and high cooling rates. The large proportion of dendrites causes the flakes to line up in geometrical patterns which follow the general outlines of the dendrites.

At the concluding gray iron session under the chairmanship of William Hambley, Allis-Chalmers Mfg. Co., West Allis, Wis., a general scrap clinic was conducted by C. V. Nass, Fairbanks, Morse & Co., Beloit, Wis. An outline of common foundry defects, cuts, blows, scabs, dirt, cracks, checks, shrinks, distortion, cold shuts blisters, buckles, sand burning in, precipitated a lively discussion from the floor. Considerable information of much practical value was presented.

Considers Malleable Problems

Problems connected with the malleable iron industry were considered at two sessions Thursday and at three sessions Friday. Prof. J. F. Oesterle, University of Wisconsin, presided at the first meeting where A. J. Bulfer, Corn Products Sales Co., Chicago, presented a paper under the title "Use of Cereal Binders in Core and Molding Sand." Further discussion was led by Frank J. Faller, of the same company. The speaker first discussed general properties of raw starches, modified starches or dextrines and gellatinized starches used as binders in the foundry. Raw starches and dextrines have been in use in the foundry for many years. Gelatinized cereal binders first were introduced during the war period. Basic advantage of that class of binder is the faculty of gelatinization or pasting in cold water. A number of slides illustrated the characteristic property of the starch gelatinization and flake formation. According to the speaker practical operation has shown that in most cases, small amounts of cereal binder added to produce pronounced

(*Continued on page* 58)

Views taken at one of the luncheons during the Wisconsin conference. Photographs courtesy of John Bing

A COMPLETE PICTURE STORY OF THE ROTO-CLONE

HERE IS YOUR COPY!

Dust control systems, applied to almost every type of industrial operation creating dust, are illustrated in this informative book. Of special interest is the Foundry Section which shows Roto-Clone installations in 15 leading foundries.

A copy will be sent you without cost or obligation. For convenience, use the coupon.

AMERICAN AIR FILTER CO., INC.
INCORPORATED
LOUISVILLE, KENTUCKY

AMERICAN AIR FILTER CO., INC.
223 Central Avenue, Louisville, Ky.

Please send me without obligation your new booklet illustrating Roto-Clone in Foundry use.

Name .....

Company .....

Address .....

(*Continued from page* 56)
advantages are of little consequence in reducing permeability.

At the second malleable session under the chairmanship of R. J. Anderson, Belle City Malleable Iron Co., Racine, Wis., James H. Lansing, Malleable Founders society, Cleveland, discussed "Selection of Various Types of Scrap for Malleable Melting." The speaker first referred to changes in practice with regard to the use of scrap in malleable air furnaces. Eighteen years ago general practice used approximately 45 per cent pig iron, 5 per cent scrap and 50 per cent sprue in an air furnace charge. Average air furnace charge today is made up of 35 per cent pig iron, 15 per cent scrap and 50 per cent sprue. In duplex practice where original melting is in a cupola with the charge in direct contact with the fuel it is a problem to keep the carbon content down to the required point. Consequently large amounts of scrap, much lower than pig iron in carbon, must be used. The scrap may range from 35 to 45 per cent, the pig iron from 15 to 5 per cent, and sprue, 50 per cent.

Compare Railroad and Other Scrap

Various factors were considered in regard to railroad and miscellaneous scrap. Customarily lower price of the miscellaneous material was accounted for by lighter weight, greater amount of rust in many cases and less care exercised in collection and classification. Figures reported from one plant where miscellaneous and railroad scrap had been used alternately showed no change in the percentage of defective castings. Without vouching for their accuracy Mr. Lansing reported a list of carload figures showing a wide discrepancy in the weight of scrap before and after cleaning. The most conservative showed a loss of over 10 per cent. The list was not at all in accord with results reported from the weighing, cleaning and re-weighing of small amounts of scrap in various plants of the Malleable Founders society where the average loss was reported as less than 2 per cent.

Mr. Lansing also referred to the results of an A.F.A. shrinkage study made some three years ago. Possible effect of the components of the charge and the analysis of the metal cast formed an interesting basis for exchange of experience and opinion. So far as the test casting was concerned variations in carbon content within the customary malleable iron range did not affect the amount of shrinkage. At the first malleable iron session Friday morning with C. A. Gutenkunst Jr., Milwaukee Malleable and Gray Iron Foundry Co., in the chair, Mr. Lansing presented an interesting talk in the general subject of shop practice.

R. J. Anderson, Belle City Malleable Iron Co., Racine, presided at the last malleable iron session where Prof. Enrique Touceda, Malleable Founders society, continued the discussion on shop practice. He spoke of the importance of surface finish not only as appealing to the eye, but because of the influence it exerts on the life and the physical properties of the metal. He devoted a considerable section of his paper to a general discussion of sand and the part it plays in the production of castings. Excess moisture produces steam, the principal cause of blow holes, but many other minor factors are responsible for internal and external defects. Small clay pellets may roll into corners or along the joint line. In some instances pin holes have been traced to the presence of sea shells in the sand. Many malleable iron castings in the white iron stage are cracked by carelessness in knocking off the gates and thin fins. In the opinion of the speaker and of others who joined in the discussion, pickling is the most thorough method of cleaning castings for enameling, tinning or galvanizing. However, it is a comparatively awkward process. The usual tumbling and pressure blasting with sand or metal abrasive is quite satisfactory for the great bulk of malleable iron castings. On the subject of sand permeability a scale reading of 27 was fairly satisfactory, 40 represented the ordinary average while with 60 one might expect a rough surface on the castings. At the final meeting Friday afternoon, under the chairmanship of Prof. J. F. Oesterle, the fundamentals of annealing were presented by Prof. Richard Schneidewind, University of Michigan, Ann Arbor, Mich.

Heat Treat Steel Castings

Robert C. Woodward, Bucyrus-Erie Co., South Milwaukee, led an interesting discussion on heat treatment and the making of heat treated steel castings at the first steel session under the chairmanship of C. E. Silver, Smith Steel Foundry Co., Milwaukee. Expressed opinion from the floor indicated lack of unanimity on whether it is better to secure certain physical properties through suitable heat treatment of plain carbon steel, or by the use of alloys.

The steel session on Thursday afternoon featured a discussion of "Molding and Core Material for Steel Castings," by H. L. Campbell, American Hoist & Derrick Co., St. Paul. Paul Power, Maynard Electric Steel Castings Co., Milwaukee, presided. Mr. Campbell first discussed molding refractories used in the steel foundry, which include molding sand, core sands and silica flour. He presented an interesting chart showing grain size of silica necessary to secure any desired permeability. Under the heading of binders, Mr. Campbell first dicussed mineral binders, namely fire clay and bentonite. Mineral binders are differentiated from organic binders in that the former are not destroyed by heat, while the latter are softened and destroyed.

Sufficient Water Needed

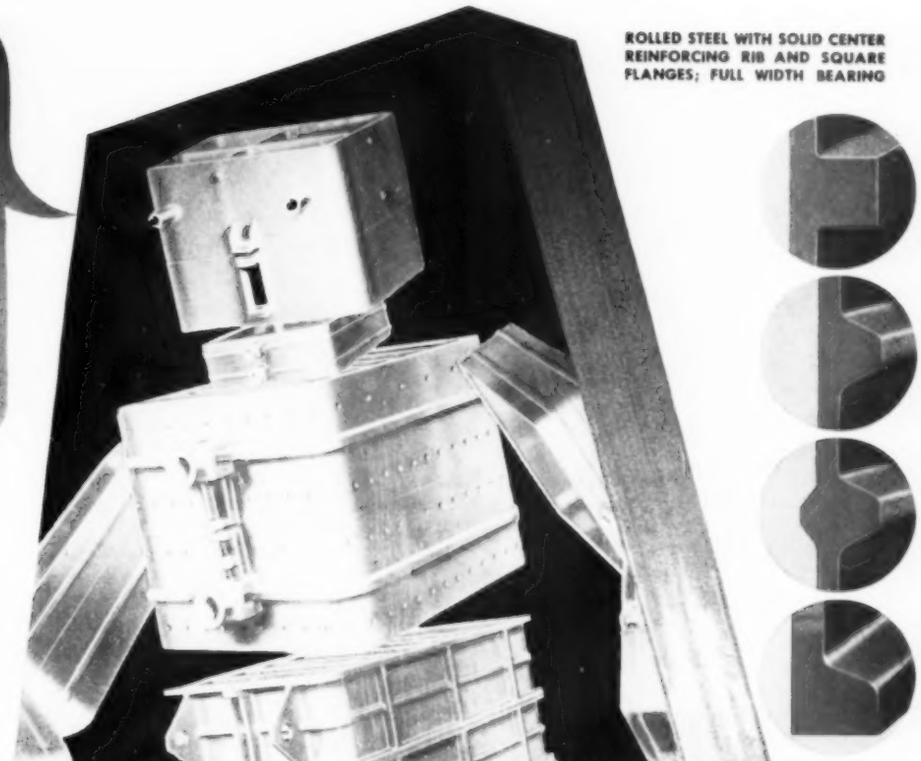
Organic binders include the drying oils, such as linseed, perilla and soy bean; the water soluble binders including gelatinized starch, dextrin, legnone and molasses, and pitch and resin. The speaker stated that organic binders permit free contraction of the metal in the mold without causing trouble with hot tears. Water up to 4 per cent causes a swelling of the sand, due to the surface tension of the water, but as the percentage is increased and water fills all the voids between the grains, the sand comes back to the original size. The speaker stated it is important to have sufficient water in connection with water soluble binders to secure the maximum bonding qualities. His investigations show that often not sufficient water is used, and that in such cases some of the binder could be eliminated and better results produced. At the same time, only the minimum amount of water necessary to secure the desired results should be used, since excess water requires additional baking time. Mr. Campbell also outlined other general principles relating to these materials, as an introduction to the general discussion which followed. Group discussion was on the influence of water additions to sand mixtures, the compositions of core pastes, gas evolved from different core binders, and the effects of moisture absorption on the properties of cores.

An interesting talk and blackboard discussion on "Heading and Gating of Steel Castings" was presented by Fred A. Pritzlaff, Falk Corp., Milwaukee, at the first steel session on Friday morning. C. E. Silver, Smith Steel Foundry Co., Milwaukee, presided. Mr. Pritzlaff discussed methods of determining the type and number of risers for several gear blanks produced by his company.

As an example he mentioned a gear weighing 5 tons, with about 50 inches outside diameter, 24-inch flange, 4-inch rim thickness, 4-inch web and a heavy hub tapering toward the web. The gear is machined all over and must be perfect in all details. Experiments showed that a ring riser is most satisfactory, although from 4 to 6 risers have been used on the rim with good results. In either case it

(*Continued on page* 60)

"I'M TOUGH, SURE, BUT I'M REALLY VERY EASY TO HANDLE!"



ROLLED STEEL WITH SOLID CENTER REINFORCING RIB AND SQUARE FLANGES; FULL WIDTH BEARING

PATENT No. 1974292

Today's engineering has divorced strength from weight. Outstanding examples are STERLING FLASKS; they have surplus strength for toughest foundry jobs—yet minimum weight for easy handling. Here's a combination that makes for lower cost, faster production. Install tough STERLING FLASKS now.

See us at the FOUNDRY SHOW Chicago. BOOTH No. 95

STERLING WHEELBARROW COMPANY

7100 W. WALKER ST.
MILWAUKEE, WISCONSIN

(*Continued from page* 58)

has been found advisable to wedge the inside of the rim on the cope side heavily to insure solidity at the junction of the thick web with the rim. That same condition applies to the junction of the web and tapered hub on the cope side. Headed in that fashion, the gear blank can be produced without risering external or internal chills.

Mr. Pritzlaff also described the gating of arm type gears, and the general run of medium and heavy steel castings. He pointed out that in the past few years, the practice of running the gate into the riser has grown. Running metal into a riser on top of the casting and allowing it to drop down may work out satisfactorily where the amount of metal poured is reasonably small and where the metal may drop on cores instead of green sand. With larger castings, the reversal method has been used successfully. With regard to gating, the speaker pointed out that there is a difference as to whether a bottom pour ladle or a lip ladle are used. With the terrific errosive action of the bottom pour ladle, it is essential that great care be used in routing the metal into the mold.

Show Causes for Steel Defects

At the Friday morning session, with O. F. Patzke, Smith Steel Foundry Co., Milwaukee, in the chair, C. W. Briggs, technical adviser, Steel Founders Society of America, Cleveland, presented a paper on steel casting design. He stated that hot tears and shrinkage cavities are prevalent in poorly designed castings. Hot tears come from large temperature differences in castings where excessive internal stresses cause members to separate or crack at temperatures slightly below solidification temperature. Cracks occur at abrupt changes in section and at sharp angles. Shrinkage cavities are due to insufficient metal to care for metal contraction at the time of casting solidification.

Deoxidation and deoxidizers were dicussed by C. E. Sims, supervising metallurgist, Battelle Memorial institute, Columbus, O., at the Friday afternoon session, presided over by C. E. Silver, Smith Steel Foundry Co., Milwaukee. Following a general description of why deoxidation is necessary, the speaker stated that manganese is considered a deoxidizer and in a small way it is. If one depended on manganese alone it would be impossible to obtain a killed steel. Manganese has a higher affinity than iron for oxygen, but as a deoxidizer it is a washout. It cannot lower the ferrous oxide content sufficiently to prevent reaction with carbon during freezing. However, it has other worthwhile properties in steel making. Silicon is a very good deoxidizer and prevents the formation of CO when present in sufficient amount. For a medium carbon steel it appears that about 0.25 per cent silicon is the minimum amount that will suppress reaction to form CO gas. For safety it is usual to give that figure a margin of about 0.10 per cent to a content of 0.35 per cent.

One of the most practical papers presented before the nonferrous group was presented by William B. George, R. Lavin & Sons, Chicago, at the first session Thursday, with Walter Edens, Ampco Metal Co., in the chair. Following a reference to sand, gating and melting in all types of furnaces the speaker listed a number of common defects often blamed on metal rather than on the true cause. The list includes: Porous spots within the walls due to improper feeding; gaseous condition from overheating or over soaking of metal; leakers caused by oxide films from cold pouring; water vapor holes driven into the casting inversely by metal penetrating into the sand; gas holes driven into the casting by metal penetration of the core slag and dross holes formed by metal boiling in the sprue and runner; slag formed while pouring metal which is dissolving the ladle lining; slag which comes in unnoticed from an old slag line under the present level of the metal in the ladle; water vapor holes caused by steam generated from paste or mud at core seams; water vapor holes from metal boiling in a low permeable sand; blow holes from low permeable sand in molds and cores. This was followed by a number of detail tables showing the analysis type of sand pouring temperature, amount of deoxidizer required for red brass, faucet brass, yellow brass, steam bronze, gun bronze, gear bronze, bearing bronze, high speed bearing bronze, manganese bronze, aluminum bronze, nickel silver, No. 12 aluminum. The table showed the tensile strength, yield point, elongation, reduction of area and brinell hardness of these various alloys.

Practice Based on Sound Theory

William Romanoff, H. Kramer & Co., Chicago, presented an interesting talk on "Casting Defects and Their Remedies," at the Thursday afternoon nonferrous session. C. V. Nass, Fairbanks, Morse & Co., Beloit, presided. Mr. Romanoff declared in his introduction his desire to de-bunk many of the old ideas prevalent for many years in the foundry industry. Today the practice followed in making castings is founded on good, sound theory. Chief factors effecting the production of castings are gating, pouring temperature, patterns, metal and sand.

Mr. Romanoff described the methods followed by the ingot manufacturers in providing a product which will meet the needs of foundrymen. He outlined the means employed in eliminating and controlling impurities and discussed the effects and limits of a number of elements. Many troubles, often attributed to the ingot, are due to various other conditions, according to the speaker. Factors which Mr. Romanoff discussed in some detail included burnt metal, practice of soaking red brasses, and machining of red brass and bronze. In his opinion there is no such thing as burnt metal. The speaker also discussed numerous special nonferrous alloys.

Describes Plaster Molds

At the Friday morning session under the chairmanship of William Eck, Wisconsin Aluminum Foundry Co., Manitowoc, a description of plaster molding for improving accuracy and appearance with pressure plate patterns was presented by M. E. Koler, Scientific Cast Products Corp., Cleveland. An elaborate display of patterns made according to the plaster method materially assisted the speaker as tangible illustration of the merits and economies of the process. In addition to a method of molding which requires only a single master pattern for making a multiple plate, the metal is poured into the mold under pressure. When the pattern leaves the mold it is as clean all over and as accurate to dimensions, according to Mr. Koler, as if it was machined all over. The developers of the process are still experimenting and think the process is and will be a formidable contender in a field now dominated by die castings. At this same session a description of disk grinding equipment and methods was presented by A. J. Bowen and C. J. Brice, Gardner Machine Co., Beloit, Wis.

Harry W. Dietert, Harry W. Dietert Co., Detroit, discussed "Sand Control—Aluminum and Brass" at the second nonferrous session on Friday morning, with Don Stevens, H. Kramer Co., Chicago, presiding. Mr. Dietert stated that in the case of brass castings to be plated, much labor can be saved if the permeability of the sand is held between 12 and 30, depending on the weight of the casting which causes the gas pressure to flow away from the molten metal and the metal to penetrate the sand slightly. This eliminates pinholes, which are difficult to remove by polishing. The small roughness caused by ample permeability may be polished off easily. Fluidity of nonferrous metals is reduced materially when the sand is tempered heavily.

The speaker stated hot cracks, which may be due to the pull of the metal, may be caused by using a core which is too hard. Collapsi-

(*Concluded on page* 96)

WESTERN FOUNDRYMEN MEET AT Del Monte

PACIFIC Coast regional foundry meeting, held in conjunction with the sixteenth annual conference of the Iron, Steel and Allied Industries, at the Del Monte hotel, Del Monte, Calif., was arranged by the Northern and Southern California chapters of the A.F.A. The meeting, which was held on Feb. 8, was attended by Henry S. Washburn, Plainville Casting Co., Plainville, Conn., and president of the American Foundrymen's association, and C. E. Hoyt, executive vice president of the American Foundrymen's association. A photograph of the conference is reproduced on pages 38 and 39 of this issue.

Small Foundries Predominate

At the morning session Mr. Washburn spoke on, "Merchandising Jobbing Castings," in which he pointed out that the average jobbing foundry is a small unit since 26 per cent of them employ from one to 25 men, while approximately 39 per cent employ from 26 to 58 men. Successful merchandising is that which provides work for all manufacturing departments at a selling price which enables payment of fair wages of labor, provides for a fair return on the invested capital, and allows for a reasonable addition to surplus to carry the firm through periods of lower production. One of the most important points in merchandising is to have a good cost system on which to base proper prices. Another feature of merchandising is co-operation with the prospective customer, giving him benefit of long experience in the best ways of producing castings, and suitable alloys for the particular services required. Such effort is beneficial both to the customer and to the individual foundry.

Mr. Washburn cited several specific examples to illustrate the latter. One was water jacketed, pressure tested cylinder head which, it was estimated, could be made for 5¾ cents a pound if there were no complications. Investigation showed expensive machining operations which cost eight times as much as the casting, and that the machine shop loss ran not less than 40 per cent, due to casting defects which appeared only after machining was completed. The firm was given an order to make up pattern equipment with the understanding that actual cost would be paid by the purchaser until the job was right, and then a definite price would be quoted. Since then several thousand castings have been made from the pattern with a machine shop loss well under 2 per cent. Price of the casting is 11 cents a pound, and the purchaser's cost for the casting plus machining has been reduced considerably.

At the afternoon session with Albert G. Zima, chairman of the Southern California chapter of the A.F.A., presiding, C. E. Hoyt, executive vice president of the A.F.A. spoke on, "Activities of the American Foundrymen's association." J. P. Gill, chief metallurgist, Vanadium Alloy Steel Co., Latrobe, Pa., and president of the American Society for Metals, presented an interesting discussion on, "Machining of Metals," which was accompanied by motion pictures depicting various machining operations.

Donald J. Reese, development and research division, International Nickel Co., Inc., New York, presented a paper on, "Foundry Cupola Operations," in which he discussed the relationship between cupola diameter, weights and sizes of materials entering the charge; function of the coke bed, and the relationship between coke and quality of iron produced, and the various methods used to tap a cupola with their relationship to the quality of the product. Mr. Reese also discussed production of high test cast iron, effect of various alloys, and the manufacture of special alloy iron. He accompanied his talk with natural color stereoptican views of pouring operations which he used to illustrate the correlation between pouring temperature and physical properties of gray iron.

Final session of the regional meeting was a dinner meeting held in the evening with S. D. Russell, chairman of the Northern California Chapter, A. F. A., presiding. First speaker on the program was President H. S. Washburn, who presented a brief address on, "Objectives of the American Foundrymen's association." He was followed by Donald E. Cummings, director, division of industrial hygiene, University of Colorado, Boulder, Colo., who presented a paper on, "Hygiene in the Foundry." Final paper of the session was presented by J. D. Fenstermacher, Columbia Steel Co., San Francisco, on, "Use of Castings in Ship Construction."

All Officers Re-elected

Officers of the Iron, Steel and Allied Industries of California were unanimously re-elected for the forthcoming year. They include: Chairman, B. J. Osborne, Moore Drydock Co., Oakland, Calif.; vice chairman, C. B. Tibbets, Los Angeles Steel Casting Co., Los Angeles; and secretary, C. S. Knight, California State Chamber of Commerce. Named to the executive committee for foundries, were Charles P. Hoehn, Enterprise Foundry Co., San Francisco, and E. M. Welch, American Manganese Steel Co., Oakland, Calif., for Northern California, and C. B. Tibbets, Los Angeles Steel Casting Co., Los Angeles, and Martin Madsen, Madsen Iron Works, Los Angeles, for Southern California.

Birmingham STAGES EIGHTH CONFERENCE

Frank M. Dixon, governor of Alabama (left) and Lester M. Shannon, vice president of the A.F.A.

EIGHTH annual foundry practice conference of the Birmingham District Chapter of the American Foundrymen's association, held Feb. 22 to 24, broke previous attendance records, with a total registration of 704. Highlights of the conference were technical sessions, a complete program of plant visitation, and the annual banquet on Friday evening, which featured an address by the Hon. Frank M. Dixon, governor of Alabama, and the honoring of four men of the Birmingham district selected as "Modern Pioneers" by the National Association of Manufacturers.

R. C. Harrell, Stockham Pipe Fittings Co., and chairman of the Birmingham chapter, presided at the banquet and presented the "Modern Pioneer" awards to the following: W. D. Moore, president, American Cast Iron Pipe Co., Birmingham; Wallace L. Caldwell, president, Aerocrete Western Corp., Birmingham; John N. Crothers, director of research, Monsanto Chemical Co., Anniston, Ala.; and James P. Dovel, retired. Mr. Moore acted as toastmaster and introduced Governor Dixon, who spoke on, "Importance to the Nation of the Solution of the Economic Problems of the South."

In addition to those previously mentioned, the following were at the speaker's table at the banquet. Karl Landegrebe, vice president, Tennessee Coal, Iron & Railroad Co.; Carson Adams, vice president, Adams, Rowe & Norman Coal & Coke Co.; Herbert Stockham, president, Stockham Pipe Fittings Co., president of the Associated Industries of Alabama and director of the National Association of Manufacturers; Lester N. Shannon, vice president, Stockham Pipe Fittings Co. and vice president of the A.F.A.; Robert E. Kennedy, secretary of the A.F.A.; C. D. Barr, vice president, American Cast Iron Pipe Co.; Charles Bransford, district manager, Republic Steel Corp.; J. A. Vann, president, Young & Vann Supply Co.; J. W. Porter, president, A.B.C. Coal & Coke Co.; David Giles, resident manager, U. S. Cast Iron Pipe Co., Chattanooga, Tenn.; Dr. E. V. Jones, Birmingham Southern college; Dr. L. E. Duncan, president, Auburn college; Dr. Richard Foster, president, University of Alabama; Dr. H. G. Davis, president, Howard college; Hugh Morrow, president, Sloss-Sheffield Steel & Iron Co.; J. W. Morgan, commissioner, City of Birmingham; W. O. McMahon, Sloss-Sheffield Steel & Iron Co., and vice president of Birmingham District chapters; and J. A. Bowers, American Cast Iron Pipe Co., and secretary of the Birmingham District chapter.

The first technical session was devoted to a discussion of, "How Do You Sell Your Castings?" by W. W. Rose, executive vice president, Gray Iron Founders' society, Cleveland E. A. Thomas, Thomas Foundries, Inc., presided. Mr. Rose believes that the business end of the gray iron foundry industry has not kept pace in development with technical and production progress. Most of the executives began life in the sand, and despite their advancement to the front office, their hearts have remained on the foundry floor.

The romance of selling has escaped them, and according to Mr. Rose, the disposal of the marvels of the modern foundry is regarded as a dreary necessity. The speaker pointed out that the foundry market is inelastic, where, except in isolated cases, desire to buy is left behind and strictly limited necessity is the governing factor. Much of the difficulty results from the fact that the industrial buyer is woefully deficient in knowledge of what castings can do for him.

Mr. Rose lamented the lack of trained foundry sales engineers and described how a foundry located in the Central West secures young graduates in mechanical engineering for training in sales work. In the training program that foundry first acquaints each potential sales engineer with the scope of the company's activities along with the engineering

(*Continued on page* 66)

A mid-west foundryman had been quoting inquiries for a considerable time but knew that he was not getting his share of the available business. A Herman engineer called on him several months ago and explained the time-saving patented features of the Herman line of molding machines and before he left the foundryman had decided to install a new Herman and to revise his production set-up to take advantage of the production speed on the Herman.

*PROFIT STRATEGY

Today this foundryman is taking in more orders than ever, turning them out in less time than he has ever done before, and is making more money on every job. Herman molding machines are doing a similar job in hundreds of other foundries throughout the country.

We will be glad to have one of our experienced foundry engineers discuss the advantages of the new Hermans with you and, if you wish, make a study of your production layout. No obligation to you, of course.

MOLDING HERMAN MACHINES

HERMAN PNEUMATIC MACHINE CO., UNION BANK BUILDING, PITTSBURGH, PA.

(*Continued from page* 64)

values of the various groups of cast irons produced by the organization. Second, it sees that each candidate is well acquainted with the fundamentals of the various departmental operations in the plant. As a third point, each candidate is schooled thoroughly in the various phases of manufacturing and operating costs. In acquiring the experience, the candidate puts in approximately 2 years of time in the following departments: Core, floor molding, squeezer molding, melting, cleaning, heat treating and pattern shop.

The extensive program is designed to permit the engineers to talk intelligently about the customer's requirements and recommend cast iron for the particular job. Also, it permits the sales engineers to recognize the various departmental manufacturing problems, and to be able to figure intelligently the various departmental costs involved in selling the product at a reasonable profit. Mr. Rose also discussed in some detail the evils accompanying selling castings by the pound, since it involves price rather than quality buying on the part of the purchaser.

Lester N. Shannon, vice president of the A.F.A., spoke on, "The Values of the American Foundrymen's Association to the Foundry Industry," at the noon luncheon. W. O. McMahon, vice chairman of the chapter, presided. Mr. Shannon outlined the purposes of the association and the contribution which that organization has made to foundry progress. He discussed the various activities, such as chapters, exhibitions, regional meetings, technical programs, committee activities, publications, safety and hygiene, and the co-operation with other related societies. Mr. Shannon stated that through the activities of chapters, membership in the association now is the highest in the history of the organization.

Discuss Safety Program

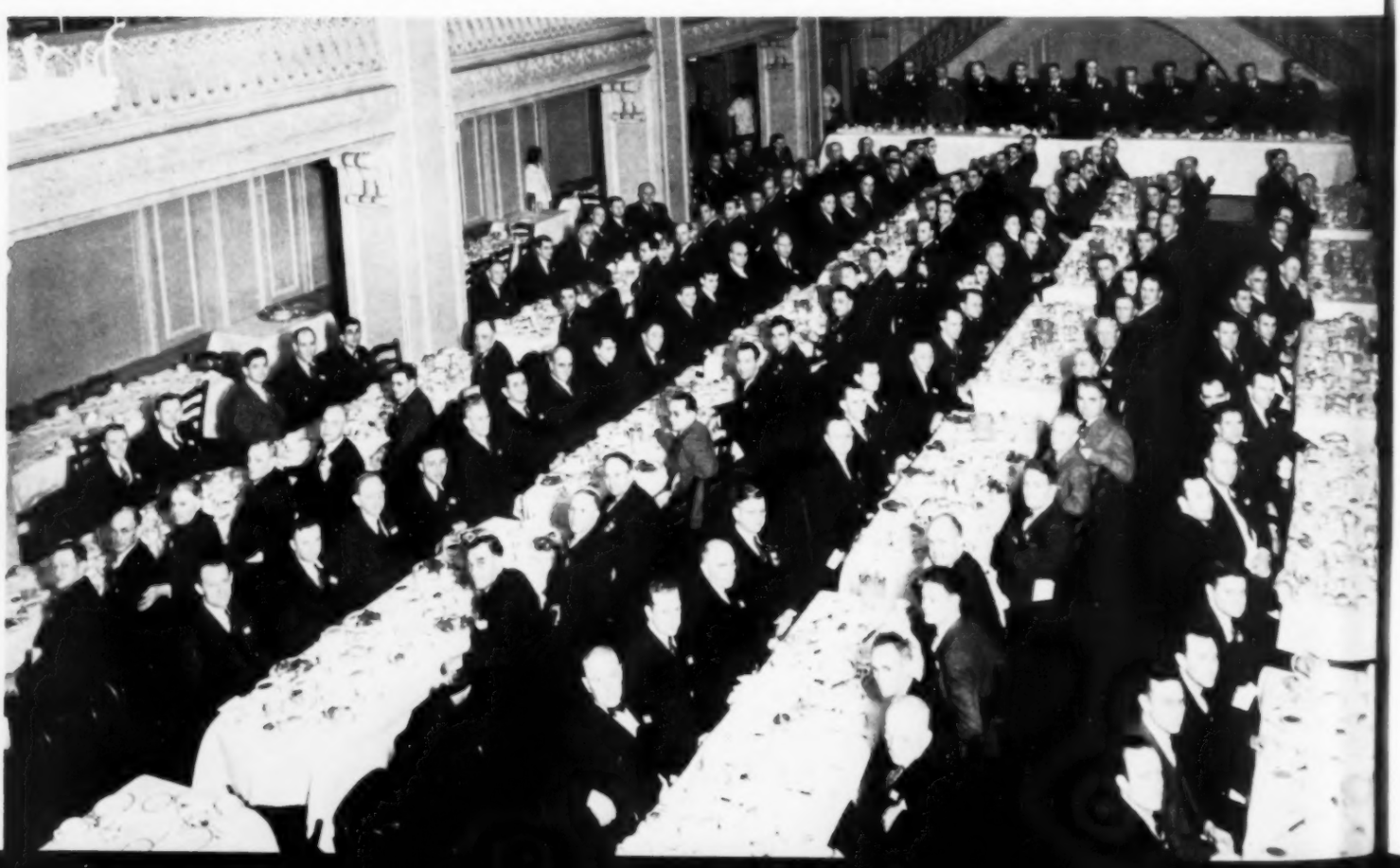
The first session in the afternoon was devoted to an inspirational talk, "Safety in the Foundry," by Warren Whitney, assistant to the general manager, National Cast Iron Pipe Co., Birmingham, Ala. W. E. Curran, Republic Steel Corp., Birmingham, presided. Mr. Whitney first spoke of the progress which has been made in safety work, as revealed by the report of the National Safety council. He pointed out that Mr. Average Worker's chances of being hurt at his job in 1938 were 1½ to 1, to that of the worker in other types of industry taken as a group, but that if he does get hurt in the foundry, it is only half as serious as if he worked in the average group of industrial workers. Yearly, the foundry industry is becoming safer. He also stated that Mr. Average Worker has need to have fear of injury, first from machinery in the foundry; second from elevators and hoisting equipment; third from vehicles and hand tools; and last from working surfaces such as ladders, floors, etc.

Mr. Whitney believes that much of the progress in the field of foundry safety is due to the effort of the workmen. Tasks that have in the past been dangerous, have been studied by these men of creative ability and initiative, and ways and means of doing the work the safe way have been found. A more enlightened management is responsible for progress in the safety in the foundry. Management has learned that efficiency and safety go hand in hand, and has adopted the real definition of efficiency presented at a recent session of the National Safety council—"Efficiency is doing the job correctly the first time at the lowest possible cost, without accident." The speaker pointed out that management and workers have learned that to take away the last two words of the definition, is to destroy its meaning.

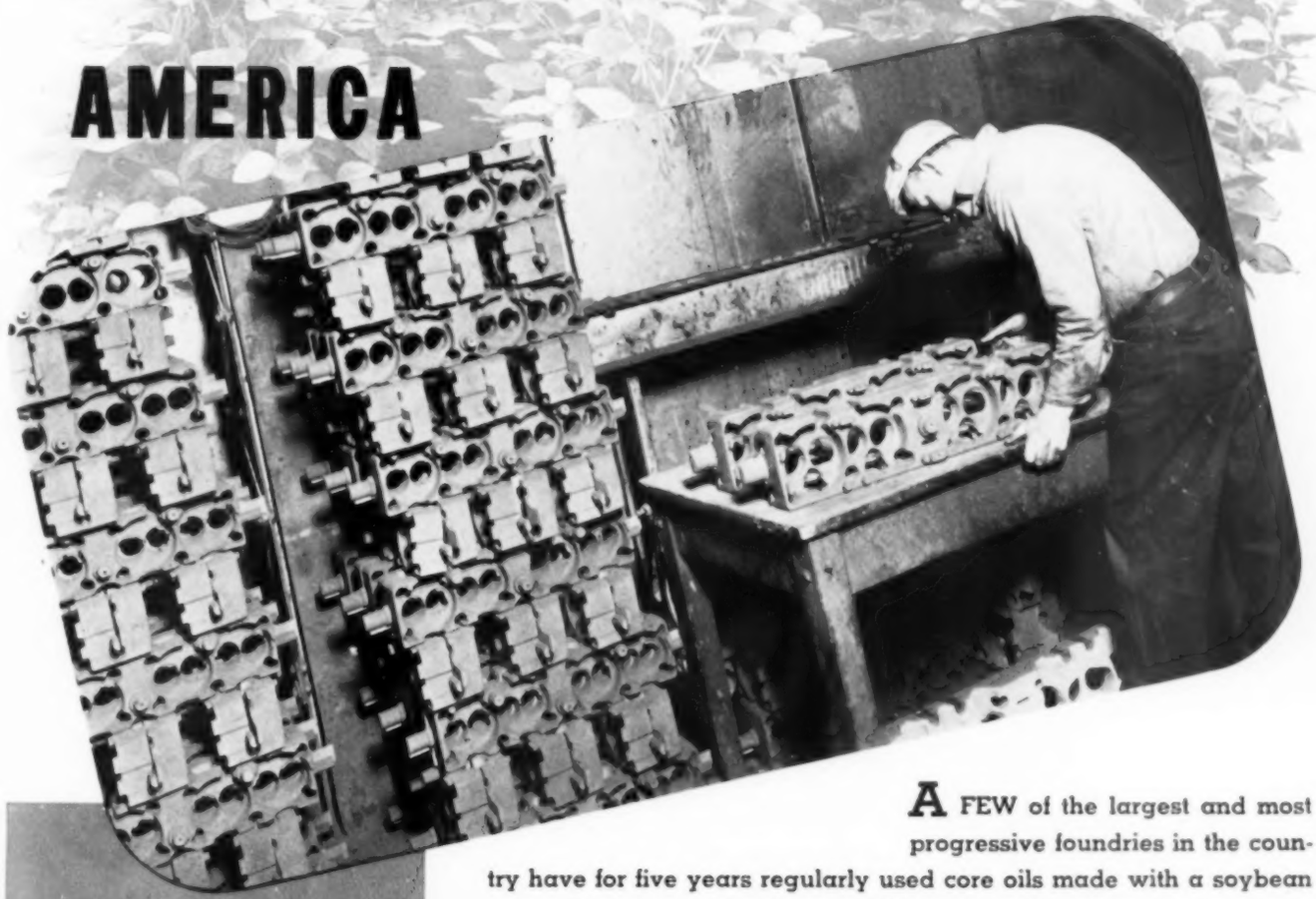
Mr. Whitney stressed the point that we cannot answer the challenge of life and all of its contingencies by ourselves. The enlistment of those around and about us indeed is necessary. Not only is it necessary for progress and development, but for enjoyment and peace as well. Human understanding in the matter of safety in industrial progress is vital. That which man has built and has not protected by understanding, sound judgment, safe thinking and careful planning, inevitably will be doomed to destruction by carelessness. Foundrymen realize that they must accept this challenge in the interest of self-preservation.

(*Continued on page* 68)

Luncheon group on the first day was addressed by L. N. Shannon, vice president, American Foundrymen's association



NEW FOUNDRY PROFITS FROM THE FIELDS OF AMERICA



See Our Exhibit at the 1940 Foundry Show... Booth No. 79, Near Main Entrance

A FEW of the largest and most progressive foundries in the country have for five years regularly used core oils made with a soybean base. Now, the perfection of SOYOL makes this economical type of binder available to all foundries, large and small, in uniform and effective quality. SOYOL offers these definite, profitable advantages:

1 It works freely in the core boxes, without sticking; 2 It is as quick-baking as any other type of binder and will stand more over-baking; 3 It gives maximum strength; 4 It does not deteriorate molding sand.

Try SOYOL in your core room; it is no longer an experiment but a proved success. And because it is based on the increasing output of a great American industry, you can be sure of an unfailing supply.

Our engineers are available to study your requirements and make valuable recommendations. For prompt attention, write

SOYOL
FROM THE FIELDS OF AMERICA

VELSICOL CORPORATION
3542 N. KIMBALL AVE., CHICAGO, ILL.

ADVERTISING PAGES REMOVED

(*Continued from page* 66)

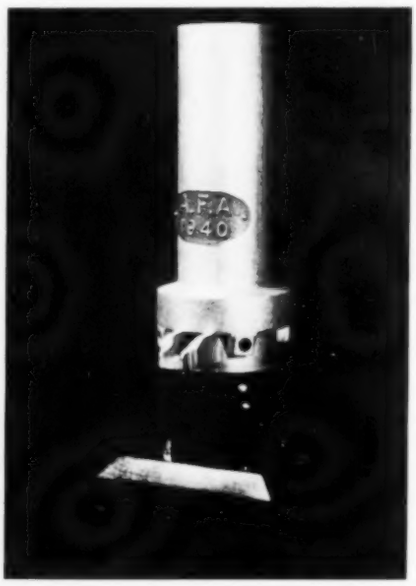
Foundrymen also realize that they are a part of American industry, an important part, and that safety is a necessary background for progress, collectively or individually. Foundrymen also are interested in the challenge because they are citizens of some community, some state and of the United States of America. They know that a safe thinking industry, state or nation, is a progressive one and holds out to its people the best there is in life.

Heredity in Pig Iron

The second Thursday afternoon session, with Dr. James T. MacKenzie, chief chemist and metallurgist, American Cast Iron Pipe Co., as chairman, featured the paper, "Off Grade Cast Iron," by V. A. Crosby, metallurgical engineer, Climax Molybdenum Co., Detroit. In defining the field, Mr. Crosby stated that the term, *off grade* iron, may be applied to any cast iron which for some reason is not suitable for the intended purpose. He stated that several years ago, pig irons were offerred for sale which were termed *off grade* because of some ambiguous element outside the normal pig iron composition such as inordinately high sulphur. Today such *off grade* pig irons are practically unknown, although it is the opinion of some that pig iron, which for some reason other than analysis gives unusual results, is still occasionally encountered. That viewpoint has been dignified in recent years by referring to these unknown quantities as hereditary characteristics. The speaker urged the foundry industry to take notes and record complete data on irons produced which are unaccountable in behavior. In that manner, all may eventually profit from the fund of information thus accumulated.

Mr. Crosby pointed out that in placing the responsibility for *off grade* cast iron, all of the raw materials entering the melting furnace should be subjected to the same degree of suspicion and criticism as pig iron customarily receives. He has always found it possible to estimate the quality of pig iron largely on the basis of chemical analysis, a yardstick not too difficult to obtain and use. It is quite conceivable, in his opinion, that the problem of inherent properties not easily discernible may be coming in for a disportionate amount of attention. However, a foundryman needs a little encouragement in that direction after he has encountered a run of leaky castings, chilled corners, excessive shrinkages or abnormal breakage. He then cited a number of case histories of *off grade* cast iron.

A special program of entertainment was provided conference visitors on Thursday evening, with R. L. Ogden, superintendent of foundries, Stockham Pipe Fittings Co., presiding. The first part of the program consisted of a sound film entitled, "Production of Iron and Steel," which was shown through the courtesy of the United States Steel Corp. This was followed by a floor show. Winner of the first door prize was J. R. Lloyd, Lloyd Metal Co., Houston, Tex. The second door prize presented during the program is shown in the accompanying illustration.



This miniature cupola, made in the pattern shop of Stockham Pipe Fittings Co., Birmingham, Ala., was won by Henry Noble, works manager, American Cast Iron Pipe Co., Birmingham, as second prize in the drawing held on Entertainment night at the eighth annual Foundry Practice conference of the Birmingham District Chapter, A.F.A. The cupola is constructed of wood with red glass over the top and tuyere openings. It contains a small electric bulb inside which when turned on gives the appearance of a cupola in operation

On Friday morning a special plant visitation program was provided under the chairmanship of J. A. Woody, assistant manager, American Cast Iron Pipe Co. The following plants were listed as open for inspection: American Cast Iron Pipe Co.; Anderson Brass Works; A.B.C. Coal & Coke Co.; Caldwell Foundry & Machine Co.; Continental Gin Co.; Dixie Bronze Co.; Miller Foundry Co.; McWane Cast Iron Pipe Co.; National Cast Iron Pipe Co.; Republic Steel Corp.; Sloss-Sheffield Steel & Iron Co., (blast furnace and by-product plant); Stockham Pipe Fittings Co.; Thomas Foundries, Inc.; U. S. Pipe & Foundry Co., (North Birmingham and Bessemer); Unit Stove & Foundry; Woodward Iron Co.; Goslin Birmingham Mfg. Co.

An interesting discussion on, "Foundry Personnel Relations," was presented at the first Friday afternoon session by H. J. Noble, works manager, American Cast Iron Pipe Co., Birmingham. Gordan E. Jones, resident manager, U. S. Pipe & Foundry Co., Bessemer, Ala., presided. Mr. Noble stated that effective personnel work depends largely on three main factors of company policy. The first factor is the degree of sincerity or desire of the company to promote personnel work which will be reflected in its policy covering the relations program. Second factor on which a successful personnel plan depends is the personnel of the personnel department, and the third is based largely upon the desire and ability to reach and deal with the individual employe rather than the promotion of a program that deals entirely with the mass or with smaller groups.

Personnel Director Important

Mr. Noble believes that the personnel director, manager or counselor, as he is sometimes designated, should attain a rank in the organization equal to that of the major supervision. His department should be ranked equal with other departments and become, with them, an accredited part of the organization and receive the same interdepartmental co-operation as any of the major divisions of the plant. The personnel department cannot function entirely as a separate institution or as a thing apart and foreign to the current plant activities.

Because no personnel director can contact daily all of the employes, it has become necessary that personnel work in a given organization should be directed first to the supervisory forces. Mr. Noble pointed out that every supervisor and foreman should become imbued with the spirit and the purpose of the program. Each, where it is practicable, should serve for a period on the personnel staff actively engaged in that work. By a system of rotation, foremen should return to their production jobs with a new sense of value of proper human relations and of the responsibility of stewardship.

The speaker stated that no personnel department that employs sufficient staff members to serve all employes and to perform all the tasks involved in the company and employe activities will justify its existence. Secret of success of a program of employe activity is that the employe be allowed to do it himself, but more so that he be given this opportunity to serve his fellow workman by having a part in the

(*Concluded on page* 71)

(*Concluded from page* 68)

promotion of the program. In conclusion, Mr. Noble stated that the secret of success of personnel likewise lies in the co-ordination of the human element in the plant. Ever developing the co-operative spirit of management and men and the development of that sense of responsibility, one to the other, which is exemplified in the words of the golden rule.

Final paper on the Friday afternoon session entitled, "How Does Sand Affect the Physical and Mechanical Properties of Castings?" was presented by Harry W. Dietert, Harry W. Dietert Co., Detroit. W. Lee Roueche, McWane Cast Iron Pipe Co., Birmingham, presided. Mr. Dietert, with the aid of slides, showed how greatly the physical properties and microstructure of a casting are changed due to variation of moisture and permeability of the sand in the mold. He stated that maximum feeding of metal is secured with the dried mold or mold containing sand tempered on the dry side. Many "misruns" or "cold shuts" undoubtedly are charged to the melting department, where, according to Mr. Dietert, they could easily have been caused by working sand high in moisture. Discussion illustrated the fact that as moisture increases in the mold, the fluidity of the metal is reduced rapidly.

The speaker stated that porosity of the casting, where the mass of metal is not too large, may be reduced appreciably, by increasing the permeability of the mold. The rate of cooling the metal increases with an increase of permeability. The graphitic carbon structure is refined as moisture and permeability increases. The size of steadite areas are reduced materially as the rate of cooling is increased, either by an increase of moisture or by an increase of permeability.

Mr. Dietert described tests where either by high moisture or high permeability such as 132, the 1.2-inch transverse bar was cooled at a sufficient rate to cause incomplete pearlitic formation leaving areas of ferrite, which are weak. Test bars cast in either heavy tempered sand or high permeability sand showed low strength, due to the undercooling effect. The maximum strength was secured when the bars were made in sand correctly tempered. The deflection of the test bars decreased as moisture content of the sand was increased. The maximum deflection was secured with dried molds. Tests also showed that chill of gray iron increased at a rapid rate as the moisture content or the permeability of the sand was increased. Mr. Dietert summarized his talk by stating that the moisture of molding sand strongly influences the rate at which the molten metal solidifies in the mold. Metal from the same ladle could be made to appear and work entirely different by cooling in different sands. Mr. Dietert illustrated his talk with a number of slides and charts.

Some of the groups attending the Birmingham conference. Photos courtesy W. W. McCullough, American Cast Iron Pipe Co., Birmingham, Ala.

Wisconsin

REGULAR meeting of the Northern Illinois and Southern Wisconsin chapter of the A.F.A. was held at Hotel Faust, Rockford, Ill., Feb. 13, with approximately 50 members and guests present. P. A. Paulson, Gunite Foundries Corp., Rockford, Ill., and vice chairman of the chapter, presided.

John T. Clausen, Greenlee Foundries Co., Rockford, Ill., brought out some facts on cupola operation in a jobbing foundry. He stated that the size of the charge plus the size of the cupola determine the uniformity of the iron. Methods were shown as to how to run a cupola with different mixtures to pour various classes of work in the foundry. Some of the troubles encountered were discussed.

George K. Minert, Gunite Foundries Corp., Rockford, Ill., in his discussion on the air furnace covered the subject with a description of the furnace, methods of charging and firing. Characteristics of the furnace and their effect on the melting iron also were discussed.

Henry C. White, Fairbanks, Morse & Co., Beloit, Wis., discussed the electric furnace with respect to operation, flexibility in producing various irons and economies. Its place in the melting department at Fairbanks, Morse & Co. was described and records given to show what can be done with an installation in a foundry.—*Henry C. Winte, technical secretary.*

Philadelphia

ONE hundred and twenty-five members and friends sat down to dinner and listened to an eloquent patriotic address by Judge Eugene V. Alessandroni of Court of Common Pleas No. 5 at the Feb. 9 regular meeting of the Metropolitan Philadelphia Chapter of the A.F.A. Judge Alessandroni spoke on, "God Bless America," how as an immigrant boy from Italy coming to this country at the age of 4, by taking advantage of free education and hard work, rose to be a judge at the age of 40. It still can be done in America today.

The technical speaker was Harry W. Dietert, president of the Harry W. Dietert Co., Detroit. He was introduced by chapter chairman, William C. Hartmann, and spoke on, "The Effect of Molding Sand on the Physical and Mechanical Properties of Castings."

Mr. Dietert stated that the moisture content of molding sand had such a great influence on the physical and mechanical properties of cast metal. Moisture materially increases the chill as measured by a step chill test pattern. Fuidity of a metal is reduced as the moisture content of the sand increases. An increase of moisture also reduces the deflection or ductility of a metal with a marked influence on the strength of a metal.

Rate of heat transferred in a mold increases with an increase of permeability. With an increase of permeability the chill depth in-

(*Continued on page* 74)

Cincinnati chapter holding its first annual party. Photos courtesy Ray Redmond, Buckeye Foundry Co., Cincinnati

It's a Fact!

SLOSS

Small Pigs DO Melt Faster

Sloss Small Pigs reduce melting costs. Experience of some of the largest and foremost melters in the country proves this is a fact in comparison not only with the larger standard size pigs, but also with other makes of small pigs.

The eason lies in the exclusive special design of Sloss Small Pigs. They are thinner and shaped to give more surface per pound of iron. This causes quicker and more even heat absorption at a marked saving in coke. They are easier to distribute evenly in the cupola charge. Therefore Sloss Small Pigs cause greater uniformity in melting, more uniform and better castings, fewer rejects, lower foundry losses.

Sloss originated Small Pigs in 1927—now makes no other kind.

Sloss Small Pigs weigh only approximately 35 to 40 pounds. They measure approximately 17½" x 5½" at the top and 13¾" x 2" at the bottom. They are "ladle-mixed" for uniformity in physical and chemical analysis.

SHIRT SLEEVE SERVICE

Sloss Shirt Sleeve Service Men are practical foundrymen, ready and anxious to cooperate with your own staff (without charge) on foundry problems of all kinds.

Are you getting your copy of Pig Iron Rough Notes?

AFA BOOTH
NUMBER 123
CHICAGO
MAY 4-10

SLOSS
SPECIALISTS IN FOUNDRY IRON
SINCE 1882

AFA BOOTH
NUMBER 123
CHICAGO
MAY 4-10

(*Continued from page 72*)

creases and porosity is reduced. On thin castings a high permeability will cool the metal sufficiently to reduce fluidity. Grain size of a metal is reduced with an increase of permeability, with a corresponding reduction of graphite particle size. Strength and ductility of a casting may be affected by variation in permeability. The discussion was closed with a series of slides reviewing hot strength, fineness and deformation of molding sands.—*J. T. Fegley, chairman, publicity committee.*

Central Indiana

FEBRUARY meeting of the Central Indiana Chapter of the A.F.A. was held at Hotel Washington, Indianapolis, on Feb. 12. W. B. George, Foundry engineer, R. Lavin & Son, Inc., Chicago, addressed the nonferrous members of the chapter on, "Melting Practices and Casting Defects in Nonferrous Foundries." At the same time in a separate room, A. J. Busch, foundry engineer, C. C. Kawin Co., Chicago, spoke to the gray iron members on, "Scrap Castings—Causes and Remedies."—*R. A. Thompson, secretary.*

New Jersey

THE New Jersey Foundrymen's association held its regular meeting on Feb. 12 at the Downtown club, Newark, N. J. C. O. Burgess, research metallurgist, Union Carbide & Carbon Research Laboratories, New York, presented an interesting talk on "Improving Cast Iron." He pointed out that the principal advantages of cast iron are long life, wear resistance, heat resistance, rigidity, damping capacity, one-piece cast construction, and low cost.

Cast iron has been improved tremendously by reducing carbon content, through use of steel scrap addition, and by alloy additions. Mr. Burgess pointed out that late additions of silicon improve cast iron by increasing strength and deflection, reducing wall sensitivity, and eliminating eutectic or dendritic graphite. That is especially true when the ladle additions are comprised of alloys containing a combination of zirconium, manganese and silicon. Chromium in small amounts improves tensile and transverse strength, wear resistance, and heat resistance. It also has a marked effect on reducing growth and oxidation.

Chromium combined with late addition of silicon, for example, 0.5 per cent chromium and 0.5 per cent silicon, gives good results for many purposes. Chromium always should be balanced by the correct quantity of some graphitizer such as silicon or nickel. One member reported that life of hardening boxes had been increased 60 to 75 per cent by use of 2½ to 3 per cent chromium.

John N. Ludwig, metallurgist, Electro Metallurgical Co., New York, also spoke briefly on the change in tactics of casting buyers, their increasing emphasis on density and graphite structure and elimination of wall sensitivity. Many of those demands can be met by use of chromium plus late additions of silicon.

F. Klein, Worthington Pump & Machinery Corp., Harrison, N. J. spoke on the new merit rating plan for state unemployment insurance taxes. The proposed bill would substitute rates varying from 0.5 to 4 per cent instead of the present flat rate of 2.7 per cent.—*John L. Carter, secretary.*

New England

FORTY members and guests braved the season's worst blizzard to attend the Feb. 14 meeting of the New England Foundrymen's association held at the Engineers' club, Boston. Edwin C. Barringer, executive secretary, Institute of Scrap Iron and Steel, New York, gave a most interesting and instructive address, "Scrap—Cinderella of Raw Materials."

Scrap originates in the home, farm, factory, utility, railroad and steamship companies as well as many other places. Average life of steel is considered to be 33 to 35 years, although it may be a longer time before some types such as structural steel for buildings come back to industry, but tin cans, automobiles, etc., have a much shorter life. In discussing automobiles the speaker pointed out that there is an average of 2100 pounds of ferrous materials obtained from each car junked and that 2,500,000 autos were junked last year.

Of scrap recovered and sold in this country about 70 per cent goes to open hearth plants, 20 per cent to foundries and the remaining 10 per cent to miscellaneous industries. In 1938 4,200,000 tons of scrap were used by foundries. One interesting angle brought out by Mr. Barringer was that maximum pig iron obtainable in this country per year at the present time is 50,000,000 tons and the amount of steel ingots that could be provided in a peak year of steel production is 73,000,000, so it is imperative to have a source of supply in scrap to make up the difference if this condition should arise. Regarding the export of scrap, the speaker stated that probably not more than 10 per cent of that produced is exported. In 1939 there were 39,000,000 tons of scrap used at home and 3,500,000 tons exported. Also, 70 per cent of scrap exported is of inferior material such as No. 2 bundles which consist of plate, barrels, auto bodies, etc., compressed into bundles the size of an orange crate and weighing 700 pounds.—*M. A. Hosmer.*

Detroit

PROVISION of suitable melting facilities for supplying a variety of iron mixtures in widely fluctuating amounts required in the casting of iron pipe was described by Dr. James T. MacKenzie, American Cast Iron Pipe Co., Birmingham, Ala., at the March meeting of the Detroit chapter, attended by close to 100.

The speaker stated that pipe is cast centrifugally in horizontal machines handling 3, 4, 6, 8, 10 and 12-inch and larger diameters. Larger sizes, 30, 36, and 48-inch made in dry sand molds with loam cores, are cast vertically in circular pits. For heavy tonnage requirements, two 72-inch cupolas were split vertically and the halves were moved apart 30 inches. Halves of each were joined by plates 30 inches wide and lined with bricks for form a cupola oval in cross section 72 x 102 inches. Using the same blast pressure the enlarged cupola with a 50 per cent increase in diameter and a 20 per cent increase in perimeter, melts from 35 to 40 per cent more metal in a given period.

Two 42-inch cupolas with 5-ton forehearth, two 60-inch and a 21-inch unit, the latter built inside a 72-inch cupola, and used to supply iron needed in the permanent mold casting of bolts for pipe joints, are other facilities operated. As requirements dictate, iron from one source can be mixed with that from another to adjust desired analysis, etc. By this multiple-cupola method, it is possible to keep abreast of demands of casting machines. During the depression the arrangement aided in adjusting production to the reduced level of that period.

The large cupolas operate on hot blast and a coke-iron ratio of 1 to 12. Spout temperature of the molten metal is around 2650 degrees Fahr. Cupolas are slagged through the front. Smaller cupolas operate on cold blast and a coke-iron ratio of 1 to 9, with pouring temperature of about 2600 degrees.

Prior to the technical presentation, the members and guests were entertained by J. M. Lathrop, advertising manager, THE FOUNDRY, who quoted figures to show the size of the nation's foundry industry, and then mystified the spectators with a number of his expert sleight-of-hand demonstrations.

The February meeting of the Detroit chapter on Feb. 15 was at-

(*Continued on page 76*)

A PROFIT OF A DOLLAR A DAY PAYS FOR THIS S·P·O MOLDING MACHINE IN A YEAR

The No. 100 Series of SPO Jolt Squeeze Molding Machines is designed for speed, power and dependable operation; in short, to pay off the initial cost quickly and then go on making a good profit for the foundryman.

That's all it takes — one little dollar, net, per day to give you back the entire purchase price of a SPO Jolt Squeeze Molding Machine by the end of the first year. After that the equipment is yours, "free", to present you with a handsome bonus for years to come. If you have any question as to the ability of a SPO unit to achieve that result, then you owe it to your business to let a SPO representative answer your question. . . . *Just a dollar a day.*

SPO

INCORPORATED

Manufacturers and Specialists in Molding Machines, Vibrators, and Patterns for Production

East 61st Street and Waterman Avenue · · Cleveland, Ohio

(*Continued from page* 74)

tended by 65, through competition of the "Modern Pioneers" celebration the same night at which a number of foundrymen were present. An illustrated talk on developments in color photography were presented by a representative of Eastman Kodak Co., Rochester, N. Y.

F. W. Pedrotty, American Foundry Equipment Co., and Ronald Webster, Hydroblast Corp., Chicago, collaborated on a discussion of dry and wet cleaning of castings, briefly illustrating their respective processes with motion pictures and lantern slides. Half hour of discussion followed their presentations.

Many local foundrymen plan to attend the annual foundry conference sponsored by Michigan State college, April 12 and 13 at East Lansing, Mich. A comprehensive program on melting and solidification, published on page 82 of this issue, has been arranged.—*A. H. Allen.*

Ontario

ONTARIO Chapter started off 1940 with a well attended meeting Jan. 26, at the Carls-Rite Hotel, Toronto, under the chairmanship of D. J. Macdonald, Dominion Radiator and Boiler Co., Ltd., Toronto, Ont. Special entertainment was provided and an outstanding feature of the gathering was the movie, partly in color, of the Chapter picnic held last September at Barnesdale, the estate of W. R. Barnes, W. R. Barnes Co., Ltd., Hamilton, Ont.

The coffee talk, given by R. B. Morley, manager, Industrial Accident Prevention association, Toronto, served in part as an introduction to the subject of "House Cleaning and the Prevention of Accidents in the Foundry Industry" which was discussed in the main address by H. Mabson, chief inspector of the association.

In introducing his subject, Mr. Mabson presented some statistics based upon an analysis of the accident experience and assessments under the Workmen's Compensation board of class 08, the foundry industry, in Ontario. In the period 1926 to 1937, the group paid assessments of $1,558,627, effected a considerable reduction in medical aid claims, temporary disability, and permanent disabilities, but suffered an increase in the deaths reported.

In the general accident section, burns have been reduced materially in number and seriousness by the replacement of cotton shirts with woolen ones, and the enforcement of use of proper molders' boots and leggings. Eye injuries were cut down by better mechanical guarding of grinding wheels and the provision of suitable goggles. The large number of injuries from handling materials has been decreased by the use of proper hand leathers or gloves, careful checking of materials-handling equipment, such as cranes, education of workers in the right mthods of using the equipment, and better systems for the storage of flasks. Around the cupola greater safety is achieved by the use of screen guards above workmen engaged in repairs, and the instruction of workers in safe methods of operation. Accidents with ladles may be reduced by protection of ladle gearing from splashes of hot metal which might render it useless, and by careful inspection of this equipment for mechanical defects, dampness in lining, etc. Proper installation and grounding of electrical equipment is a point to be watched by all concerned.—*G. L. White.*

W. P. Woodside, Climax Molybdenum Co. and past president of the A.S.M. and Harry W. Dietert, Harry W. Dietert Co., and chairman of the Detroit chapter of the A.F.A., were snapped at the recent joint meeting of the two chapters held at the Fort Shelby

Northern Iowa

FEBRUARY meeting of the Northern Iowa Foundrymen's association was held at Cedar Falls, Iowa, Tuesday, Feb. 27. Dinner was served in the Commons building of the Iowa State Teachers' college and the regular meeting followed the library building. Interesting and instructive talk on, "The Why of Weather," was given by Dr. E. J. Cable, head of the science department, Iowa State Teachers' college, and a volunteer government meteorologist.

In commenting on weather forecasting, the speaker explained the methods used in the past and now being used, and indicated how greater accuracy is being developed in forecasting. However, no forecasters will predict as yet beyond 24 hours, although Dr. Cable stated that through the work of Dr. Krick, California Institute of Technology, it appears that in the near future accurate predictions will be made as much as 6 months in advance. Forecasting of this nature will be of inestimable value to industry, utility companies, agriculture, etc.

Following the talk, several reels of interesting and enlightening movie film of the navy were shown through the courtesy of the Waterloo naval recruiting station.—*R. E. Wilke, secretary.*

Central New York

CENTRAL New York Chapter of the A.F.A., held its regular meeting Feb. 9 at the Onondaga hotel, Syracuse, N. Y. H. H. Judson, Goulds Pumps, Inc., Seneca Falls, N. Y. and chairman of the chapter presided.

This was the first split meeting of the Central New York chapter and proved to be very successful. Fifty-two foundrymen assembled to hear George S. Evans Mathieson Alkali Works, New York, present the first of a series of two lectures on the subject of "Cupola," and 39 nonferrous foundrymen were present to hear a very interesting talk by H. J. Rowe, Aluminum Co. of America, Cleveland, on "Recent Developments in the Casting of Aluminum Alloys."

The subject of Mr. Evans' first lecture was, "Equipment Necessary to Produce and Handle the Metal Required for Foundries of Varying Tonnages." He described the four methods normally used to charge a cupola, each in relation to the total melt. Data were presented to show the most economical method for foundries of different capacities. Every phase of cupola construction was described. Mr. Evans related several reasons why different tuyere heights were used with different metal compositions.—*L. D. Wright, secretary.*

Mr. Rowe addressed the nonferrous group in the first session of its kind in Syracuse. The speaker referred to the steady increase in production of aluminum alloy castings, which carried with it an increase in the size of castings made. It is not unusual now to make sand castings weighing 7000 pounds, permanent mold castings weighing 20 to 50 pounds, semipermanent mold castings weighing 500 pounds and die castings weighing 12 to 20 pounds. Mr. Rowe stated that a number of recent developments took place in the aluminum industry. They include an improvement in melting practice; a definite trend to limit the speed of melting in order to reduce the amount of oxide inclusions; improvement in heat treatment, giving the metal improved characteristics;

(*Concluded on page* 79)

(*Continued from page 76*)

welding, as a means of fabricating structures; developments in furnace brazing, though still in its infancy; development of a great variety of corrosion resistant finishes, also electroplated finishes of copper, chromium, etc.

The climax of the evening was the presentation of a 2-reel sound film on the production of aluminum from ore to finished product.—*Max Ganzauge, program chairman, nonferrous group.*

Cincinnati

A HARDY group of foundrymen assembled at the Gateway restaurant in the Union Terminal Feb. 13, in spite of a heavy snow and threatening blizzard. Only 55 assembled for dinner and 17 other members arrived in time for the 8 o'clock meeting but the officers and guest speaker were more than pleased with this attendance.

The program committee in a very novel way presented Mr. William Beiser, well known to the group, who presented the coffee talk. His remarks provided ample food for thought.

The chapter's chairman, Herman K. Ewig, Cincinnnati Milling Machine & Cincinnati Grinders, Inc., reported on future plans of the organization. The names of five new members were read but only two happened to be present and were introduced to all. The new director, William Heilig, William Powell Co., also was introduced.

The meeting was then turned over to the guest speaker, Dr. C. H. Lorig, Battelle Memorial institute, Columbus, O., who spoke on the "Research and Development in Cast Metals." As Dr. Lorig's paper covered all ferrous and nonferrous castings, all present were very much interested in the contents, and a very interesting question and answer period followed.—*E. T. Korten, secretary.*

Quad City

JOINT meeting of the Quad-City Chapter of the A.F.A. and the Tri-City Chapter of the American Society for Metals, was held at the Fort Armstrong hotel, Feb. 19. Approximately 100 were present for dinner and 150 for the technical session.

Chairman Herman Alex of the Quad-City Chapter of the A.F.A. presided over the meeting, and introduced Art Reading, Zimmerman Steel Co., who in turn presented the speaker, Raymond L. Collier, secretary, Steel Founders' Society of America, Cleveland. Mr. Collier's topic was, "Steel Castings, the Sinews of Industry," and he presented an interesting discussion as to the various fields of use for steel castings. Illustrated by slides, many types of castings were shown to the group together with data as to the properties, design, and heat treatment. Many illustrations also were given in regard to castings of one piece or as few pieces as possible for assembly jobs, in comparison to other methods of manufacture where many parts make up the original assembled job with additional costs in fabricating the parts. The speaker emphasized that many problems presented in the manufacture of steel castings are so complex that close co-operation is necessary between engineers, pattern shop and the foundry.—*J. Morgan Johnson, secretary, treasurer.*

Chicago

CLOSE to 200 members and guests attended the meeting of Chicago chapter, American Foundrymen's association, held Feb. 12 in the Celtic room, Chicago Towers club, Chicago, and heard a technical discussion by an authority on the faults and defects of castings, M. D. Johnson, chief inspector, Caterpillar Tractor Co., Peoria, Ill. Mr. Johnson stressed the importance of not changing patterns for castings unless approved by the buyer, but warned that pattern improvements do not mean further inspection of castings is unnecessary.

Visual inspection represents one of the most prominent functions of inspection work, as most defects can be detected visually. For those that cannot, however, Mr. Johnson enumerated various other tests. While cracks are different in character from cold shuts, methods of inspection are much the same. Tests include sounding for tone, and the chalk and oil test. The speaker asserted he was almost ashamed to mention the chalk and oil test, because it is one of the oldest forms of test there is, but nevertheless not without merit. Besides test by painting he also cited the magnaflux test, which he stated is coming into more widespread use. A fifth test for cracks is the Bullard-Dunn cleaning method.

Mr. Johnson also recommended tests for dirt, inasmuch as some castings get dirty even after cleaning, and for burnt-in sand, which is bad for machine tools, painting and production in general. For hard iron defects and unannealed spots, he suggested the file test and also X-rays.

Spirited discussion of inspection practices followed the speaker's lecture, giving him opportunity in open forum to enlarge on the details of a number of casting tests. The Bullard-Dunn cleaning method is used by Caterpillar primarily as a test rather than a cleaning method, it was brought out. Considerable discussion revolved about the kerosene or light oil test for cracks, the speaker warning of the time element involved because of rapid evaporation.—*J. F. Powell.*

Michiana

THE Feb. 14 meeting of the Michiana chapter was held jointly with the Notre Dame chapter of the American Society for Metals at the University of Notre Dame with Prof. E. G. Mahin, department of metallurgy, University of Notre Dame, presiding. The speaker was Jerome Strauss, Vanadium Corp. of America, Bridgeville, Pa., who addressed the meeting on, "Metallurgical Applications of Vanadium."

In his talk, Mr. Strauss discussed the properties imparted by vanadium to steel and cast iron, and pointed out the special applications and commercial uses of steel resulting. The speaker directed his remarks mainly to steel, but touched briefly upon the use of vanadium in cast iron with special reference to its effect on grain structure. During his talk, Mr. Strauss showed slides comparing surface and internal grain structures. Charpy impact tests, hardness and temperatures for heating and quenching of both carbon and vanadium steels.—*V. S. Spears.*

Twin City

TWIN City Foundrymen's association held its January meeting at the Dunwoody Industrial institute, Minneapolis. Thirty-nine members and guests had dinner in the institute's dining room. Mr. F. G. Musala, state director of apprenticeship, gave a brief summary of the new apprenticeship law enacted by the last state legislature. Dr. C. A. Prosser, director of the institute then gave an interesting talk on "Dunwoody's Program." This was followed by a tour through the school where evening classes were in session.

A regular meeting was held Monday, March 4, at the North Central Commercial club, St. Paul. A steak dinner was served at 6:30 p.m. with 49 present representing 19 foundries. H. H. Blosjo, president of the association, introduced the speaker of the evening, Prof. E. H. Comstock, dean of the School of Mines, University of Minnesota who gave his famous lecture on "Wildcats and Doodlebugs." Professor Comstock gave a brief history of some of the best known "Wildcats" in this part of the country. He had a trunk full

(*Concluded on page 106*)

DETROIT AMONG FOUNDRIES

By A. H. ALLEN
Detroit Editor, The Foundry

SILENT testimony as to how busy die foundries and die shops are at the moment can be realized by inspection of the pattern storage yards adjoining some of the foundries catering to this trade locally, including Detroit Gray Iron, Stuart Foundry, Central Foundry and a few others. These yards are no mere pens, and in many instances cover as much space as an average city block. Right now they are piled high with the strangest assortment of wooden shapes a person could imagine, all patterns for dies to produce some vital part in 1941 models.

Die business came out early this season. A start was made back in December, 1939, and indications point to a continuation of rush demand well into the summer. Slack season in the die foundries starts around September and usually continues through December until the new programs are released.

All Die Shops Are Busy

Dies for roof tops, doors, front and rear fenders, quarter panels and a variety of other stampings are going through the shops now. Die foundries, like Stuart and others, are pouring on almost daily schedules. Stuart usually starts tapping a cupola late in the afternoon, and in a busy month will pour around 600 tons, or 30 tons daily. Thirty tons is not much metal for a heat when the heft of some large dies is considered—in the neighborhood of 15-18 tons for the big ones.

Molds for these large castings as well as those for smaller dies, going down to 1 ton and even less, are formed in pits in the foundry floor. This is done because of the terrific pressure to which the mold is subjected after a large casting is poured. Heavy weights are placed on the molds, or heavy binder bars are attached by long bolts to plates in the bottom of the pit. Castings are allowed to cool in the molds for varying periods up to 48 hours.

At Stuarts' iron is melted in 62 and 92-inch cupolas. Most specifications call for alloy content. Metal is tapped at around 2800 degrees Fahr., into large ladles and occasionally two ladles are required to fill a single mold. Large dies are poured with the face or working side on the bottom. A special facing sand mixture is used on these areas. Main sections of the mold are rammed with sand on the floor, which is used over and over. After the casting is removed the pit is made ready by lifting the sand out with crane and clam shell bucket.

A small 18-inch diameter cupola adjoins two larger ones and supplies iron for experimental purposes. This unit is an accurate replica of the larger cupolas and is complete with automatic skip hoist for charging, and other accessories.

From activity of the die foundries, it may be deduced logically that extensive changes are in store for 1941 models. It is difficult if not impossible to ascertain clearly what they are by inspection of the dies themselves. The foundry operators do not even know specifically what major changes in body lines will be since most of their work is for die shops and not for the motor companies directly. The foundryman simply receives the pattern from the die shop, casts the die, shakes it out, cleans it, ships it and then tosses the pattern on the storage pile without paying much attention to who the die is for, or what it looks like.

May Be Periscope on New Car

Of course some study has to be given to proper molding and positioning, but this is a straight foundry problem. Men in the business cannot tell whether the new Fisher bodies will have creases in the fenders, periscopes in the roof, or deeper doors. They seem to take pains to avoid learning these details, probably from the standpoint of insuring against too early release of new model details.

Reference to periscopes, by the way, was not made in a joking sense. Reliable reports indicate that designs have been evolved with periscopes built into roof tops to replace the former rear-vision mirrors, in the effort to improve the driver's perception of conditions in the rear.

Nash, Packard, Hudson and all the General Motors divisions including Chevrolet have been proceeding with comprehensive die programs for some weeks. Chrysler divisions are expected to release major requirements shortly.

Some foundry operators and superintendents profess to notice a serious shortage of skilled molders this season, so much so that actual hindrance to production is encountered. Many skilled workmen, toolmakers, diemakers and patternmakers, in this area have succumbed to the lure of the aircraft industry which through the classified sections of newspapers has held out attractive lures in the form of high wages and payment of moving expense to the East and West Coast.

Availability of skilled help in the foundry industry is becoming further complicated by the fact that new generations of young men seem to prefer other types of work, and apprentice training of such personnel is lagging. Managements look ahead ten years and wonder where they will find any of these men then, considering the scarcity now.

Molding Becomes Automatic

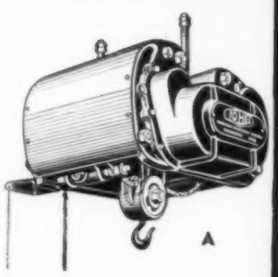
This apprehension may be needless, of course, if some of the dreams of technical experts today materialize. Molding may become entirely automatic in the smaller foundry just as it nearly is now in the large automotive foundries which do not require skilled molders to operate their highly mechanized equipment. As a matter of fact, a skilled molder is at a disadvantage in the mechanized foundry where the chief demand is production speed, and quality of workmanship supposedly is insured by foolproof equipment.

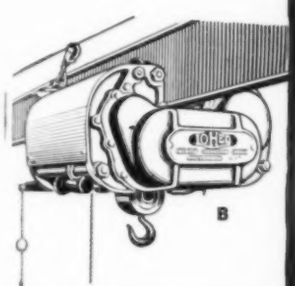
In recent conversation with the writer, Carl Harmon, who operates a jobbing steel foundry in Saginaw, stated that in his opinion the shortage of skilled labor in foundries was not as serious as some persons make it out to be. He pointed out that he had successfully trained a number of molders in his shop. Starting with raw recruits he had brought them to the point where now they were turning out expert work.

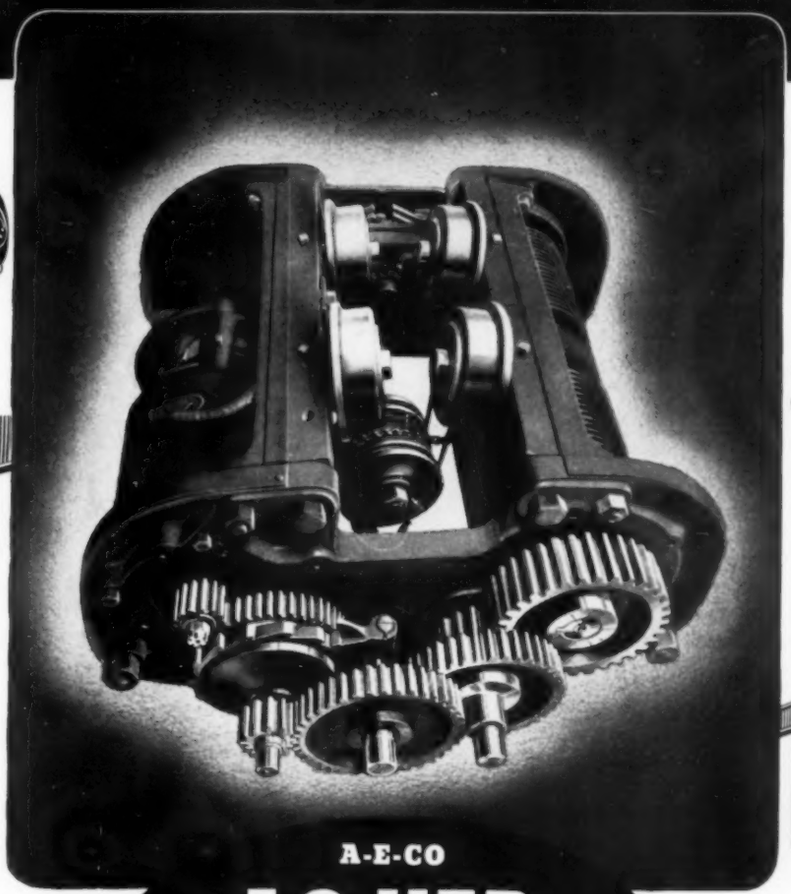
New automobile models may see a more widespread use of the cast automotive crankshaft. Preliminary tests are being made by at least

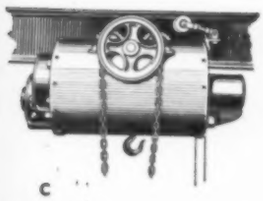
(*Concluded on page* 82)

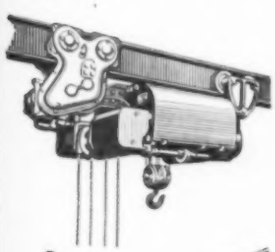
GET the hoist with every *worthwhile* feature

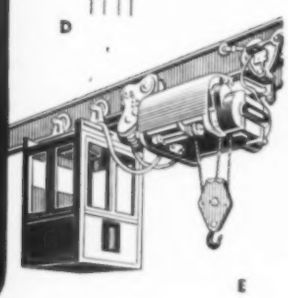

A


B




C


D


E

THERE'S A LO-HED ELECTRIC HOIST FOR EVERY PURPOSE

A—Bolt Suspension Type.
B—Plain Trolley Type.
C—Hand-Geared Type.
D—Motor Driven Trolley Type.
E—Cab-Controlled Type.

CAPACITIES FROM ¼ to 12 TONS

A-E-CO

LO-HED *Time-tested* HOISTS

When you buy an electric hoist you want all the *worthwhile* features a hoist should have. Here is the way to get them: specify LO-HED. Lo-Hed construction includes *every* feature that the test of time has proved desirable. A-E-CO engineers have successfully resisted every temptation to add gadgets which would only have provided mere "talking points" or "improvements" which would not better performance, life, efficiency, or maintenance. Note in the open-view of the Lo-Hed Hoist the logical arrangement of the hook between the drum and motor for minimum headroom. And these time-tested features: heavy duty hoist motor, automatic lowering brake, automatic bearings, stub shafts, grooved drum, plow-steel cable, 100% positive automatic stop, fire, dust and moisture-proof controller. (Construction varies slightly for classes of Lo-Heds.) • Investigate Lo-Hed time-tested construction. Write today for the complete Lo-Hed Catalog, shown below.

AMERICAN ENGINEERING COMPANY

2418 ARAMINGO AVENUE, PHILADELPHIA, PA.

OTHER A-E-CO PRODUCTS: TAYLOR STOKERS, MARINE DECK AUXILIARIES, HELE-SHAW FLUID POWER

Classified phone directories list the local A-E-CO representative in principal cities. Call him in... or write us for the hoist catalog.

MAIL THIS COUPON NOW

AMERICAN ENGINEERING COMPANY
2418 Aramingo Avenue, Philadelphia, Pa.
☐ Please send me your 26 page complete catalog of Lo-Hed Hoists.
☐ Ask your representative to call.
Name _____
Company _____
Street Address _____
City _____ State _____
(Please print plainly)

(*Concluded from page* 80)

two builders—DeSoto and Buick—on a new type of cast shaft, claimed to permit a 30-40 per cent saving on machining cost over a forged shaft, at the same time providing a material with modulus of elasticity of around 28,000,000 per square inch. Latest shaft weighs only a few pounds more than the 84-pound six-throw forging, and is suitable for induction hardening.

Cast shafts compete with forged shafts on a cost basis alone. Should the decision go in their favor, it is considered a fair possibility that additional foundry capacity would need to be installed in the Detroit district to handle the necessary production. Experiments are being made with the cast shaft for the DeSoto engine, it is understood.

Engineers are reported studying the possibility of using cast aluminum wheels for buses more extensively as a means of reducing unsprung weight. Taking their cue from the airplane industry which uses cast aluminum landing wheels to good advantage, these investigators point out it is possible, for instance, to make satisfactory disk wheels and also to use aluminum brake drums with iron liners shrunk and bolted in place, effecting approximately 30 per cent saving in weight.

Aluminum Co. of America supplies cast aluminum landing wheels to Hayes Industries, Jackson, Mich. and other concerns supplying aircraft manufacturers. The larger wheels are sand cast, incidentally requiring intricate coring. Smaller wheels and those made in larger quantities are cast in permanent molds.

Aluminum and brass castings now are furnished by the recently organized K. & C. Brass and Aluminum Casting Co., Lansing, Mich. John Kobus and Andrew Ciepiela, formerly active with the Standard Aluminum Casting Co., Lansing, now out of business, are associated with the new enterprise. A plant adjoining the Novo Engine Co. has been acquired and equipped to produce a variety of nonferrous castings.

In a recent paper presented in Detroit before the American Society for Testing Materials, S. D. Heron of the Ethyl Gasoline Corp., working in co-operation with Dr. O. E. Harder and M. R. Nestor of Battelle Memorial institute, reported tests on some 30 exhaust valve materials used in the automotive, aircraft and general engine fields. Showing up favorably was the Ford analysis of cast valve steel, with 15-16 per cent chromium, 13-15 nickel, 0.95-1.20 carbon and 2.0-3.05 silicon. It showed complete resistance to corrosion in exhaust concentrate and good resistance to scaling in both oxidizing and reducing atmospheres at high temperatures.

Program Completed For Lansing

Eighth annual foundry conference to be held at Michigan State college, Lansing, Mich., on April 12 and 13 under the joint sponsorship of the Detroit Chapter of the A.F.A. and Michigan State college will cover a wide array of topics according to Fred A. Melmoth, Detroit Steel Casting Co., Detroit, and chairman of the committee on arrangements. Technical sessions will be devoted to gray cast iron, steel, malleable cast iron, nonferrous metals and alloys, shrinkage and mold materials. The complete program follows:

Friday, April 12

8:45 a.m.—Registration

9:30 a.m.—Opening meeting.

Address of welcome by Dean Dirks, engineering department, Michigan State college.

10:00 a.m.—Technical meeting

Gray Iron

Chairman, V. A. Crosby, Climax Molybdenum Co., Detroit.

"Developments in Melting of Gray Iror.," by Don J. Reese, International Nickel Co., New York.

Nonferrous

Chairman, E. R. Darby, Federal-Mogul Corp., Detroit.

"Recent Advancements in Nonferrous Melting," by G. K. Eggleston, Detroit Lubricator Co., Detroit.

12:30 p.m.—Luncheon

Speaker, Lieut. Mulbar, Michigan State Police department, on "Lie Detection."

2:00 p.m.—Technical meeting

Steel

Chairman, F. A. Melmoth, Detroit Steel Casting Co., Detroit.

"Methods and Objectives in Modern Steel Melting," by C. E. Sims, Battelle Memorial institute, Columbus, O.

Malleable

Chairman, James Lansing, Malleable Iron Founders' society, Cleveland.

"Melting Requirements for Pearlitic Malleable," by Carl Josephs, Saginaw Malleable division, General Motors Corp., Saginaw, Mich.

Gray Iron

Chairman, R. G. McElwee, Vanadium Corp., Detroit.

"The Solidification of Cast Irons," by Dr. Richard Schneidewind, University of Michigan, Ann Arbor, Mich.

7:00 p.m.—Banquet

Toastmaster, W. Otto, Lansing chamber of commerce.

Speaker, L. B. Barnhart, speech department, Michigan State college.

Saturday, April 13

9:00 a.m.—Technical meeting

Shrinkage

Chairman, Wayne Cockrell, Michigan State college.

"Factors Affecting Shrinkage in Foundry Metals," by H. L. Womocke and C. C. Sigerfoos, metallurgical department, Michigan State college.

Mold Materials

Chairman, Vaughan Reid, City Pattern Works, Detroit.

"Mechanical Properties of Castings as Affected by Mold Material," by Harry Dietert, Harry W. Deitert Co., Detroit.

"Effect of Mold Materials on the Physical Properties of Cast Aluminum," by H. Gould, Aluminum Co. of America, Detroit.

1:00 p.m.—Luncheon

View of the Union Memorial building on the campus of Michigan State college where the eighth annual foundry conference will be held under sponsorship of the Detroit chapter and Michigan State

Specifications

American Water Works association 22 East Fortieth street, New York, has published two specifications and one recommended practice relating to cast iron pipe. All have been approved by the American Standards association. One specification is for cast iron pit cast pipe for water or other liquids, and the other for cement mortar lining for cast iron pipe and fittings. The recommended practices bulletin is a manual for the computation of strength and thickness of cast iron pipe. Price of the specifications is 20 cents each while the recommended practice is 40 cents.

CHAMPION

Molding Machines

and Equipment

JS

JR

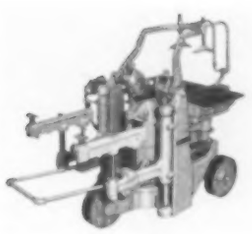
JM

W

O

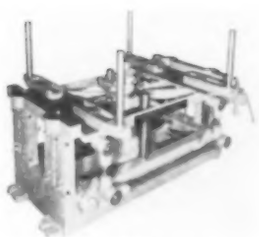
JS

Type JS Stationary Jolt Squeeze.
Type JS Portable Jolt Squeeze.
Type JR Power Jolt Hand Rollover Core Machine.
Type JM Power Jolt Hand Rollover Molding Machine.
Type PR Power Jolt and Rollover Foot Draw Rollover.
Type W Hand Rollover.
Type L Hand Stripper.
Type O Jolt Core Rollover.
Type C Plain Jolt.
Type CA Jolt Core Machine.
Type LL Power Push Off.
Type R Electric Riddle.
Type H Electric Riddle.
Type CC Casting Clamp.



PR

L



LL

C

CA

R

H

CC

CHAMPION FOUNDRY & MACHINE CO.

1314 WEST 21st STREET CHICAGO, ILLINOIS

Manufactured in Canada by John T. Hepburn, Ltd., Toronto, Canada

A. F. A. PLANS GREATEST CONVENTION

(*Concluded from page 27*)

veteran in the cupola, pig iron and coke consulting field, is to be recognized by the awarding of an honorary life membership in the association.

During the convention Dr. C. W. Mason, Cornell university, Ithaca, N. Y., will present demonstrations on "Growth of Crystals, Illustrated by Microprojection." The demonstration will show materials changing from the melted to the solid state. Although the experiments are simple and the theory is probably generally known, they give a vivid picture of what takes place and thus serve to illuminate ideas of the behavior of metals.

The annual banquet of the association will be held Thursday evening, May 9. The president of the association, Henry S. Washburn, Plainville Casting Co., Plainville, Conn., will preside. Following the dinner, the Chicago chapter is planning entertainment modeled along the lines of the justly famous ladies' night of the chapter which has proven so popular over the last few years.

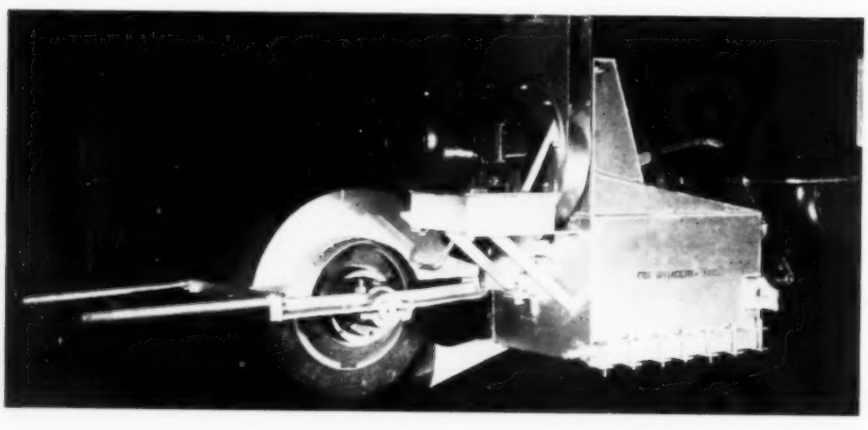
This year a committee of the Chicago chapter is reserving Tuesday, May 7, from 5 to 7 p.m. for a popular buffet smoker and get-together, providing in addition to refreshments, entertainment features which will make these hours an especially enjoyable occasion. Some mystery is attached to the plans of the committee but none will want to miss this smoker.

Another event and one long established is the annual dinner of engineering university instructors. Started as a means of promoting acquaintance among those in charge of foundry instruction at engineering schools, this dinner meeting has grown in popularity and is now under the sponsorship of the A.F.A. committee on co-operation with engineering schools. This year the theme of the discussion will center around methods for disseminating information on cast metals to engineering students.

While inspection of the foundry show and attendance at the technical sessions are the two main attractions of the week, the plant visitation committee of the Chicago chapter will provide opportunity for inspection of a large number of major industrial plants and foundries in the immediate Chicago area. A general group tour has been arranged for the afternoon of Monday, May 6, this group to inspect the blast furnace, coke plant and steel mills of the Wisconsin Steel division of the International Harvester Co. On the return trip a stop will be made at the Museum of Science and Industry to inspect the operating foundry exhibit there. During the week individual trips can be made to the following plants which are opening their doors to visitors: Allied Steel Casting Co.; American Steel Foundries; Carnegie-Illinois Steel Corp.; South Works, Chicago Malleable Iron Co.; Continental Roll & Steel Foundry Co.; Crane Co.; Griffin Wheel Co.; Interlake Iron Corp.; Link-Belt Co.; Liquid Carbonic Corp.; McCormick and Tractor plants of International Harvester Co.; Melrose Park plant, National Malleable & Steel Castings Co.; Western Electric Co., and Whiting Corp.

Dust Collector

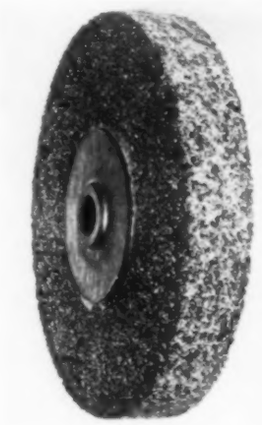
Fox Grinders Inc., Oliver building, Pittsburgh, has developed a swing grinder frame to which a dust collector device is attached as an integral part requiring no hose leading off to an outside box. Air laden with sparks and dust particles is forced through water which removes all dust and grit. The swing frame grinder is available for wheel sizes from 16 to 24 inches.



The dust collecting apparatus, an integral part of the device, is a welded steel box bolted to the frame. An adjustable funnel at the front end follows the wear of the wheel. The stream of sparks is drawn through this funnel and into a chute at a velocity of approximately 6000 cubic feet per minute. At the far end of the chute the heavy particles fall into a dry chamber. The fines are drawn over a baffle and through a water box. It is claimed the exhausted air is discharged free from all foreign inclusions. It is also claimed that with the exception of certain unusual applications, the box does not interfere with the balance of the grinder.

Wheel Bushing

Manhattan Rubber Mfg. division, Raybestos-Manhattan Inc., Passaic, N. J., has announced a development in portable tools whereby grinding wheels are mounted on a rubber bushing. Results it is stated are not



unlike those produced with floating power in automobiles where the motor is suspended on rubber. The bushing is intended for use on 6 and 8-inch straight wheels on electrical, pneumatic and flexible shaft grinders. In the present form it is not applicable to cup shape wheels.

The bushing is made in halves, each half made up of three items: The bushing portion covering the shaft and fitting snugly into the hole of the wheel; the flange only slightly larger than the flange of the machine; and a bushing bead underneath the flange immediately surrounding the spindle. One piece embodying these three features is inserted in each side of the wheel. When the flanges are drawn up by the spindle nut the bead is compressed to cause the inner bushing portion to form more intimate contact with the spindle and the hole in the wheel.

Modern Engineered Pouring System in Prominent Tractor Foundry.

76 Tons of Metal

distributed to and poured on this double line with a battery of seven Modern Pouring Devices. Castings ranging from a few ounces each to 35 pounds in the mold.

Modern Cylindrical Ladles

1 ton capacity, distribute this metal to the 32 molder line. Hot clean metal is assured with these Covered and Insulated Ladles fitted with teapot spouts. Foundry scrap reduced to an absolute minimum.

Such real pouring efficiency can only be attained with a complete MODERN - engineered system as shown here. No conveyor installation can operate at full efficiency without this equipment.

In fact, no foundry can afford to be without it. Send over for our catalogue on Ladles and Pouring Systems, describing latest developments along this line.

MODERN

Covered and Insulated Ladles

Lifetime Geared Ladles

Improved Bottom-Pour Ladles

Metal Pouring Systems

Crane and Monorail Systems for Metal and Mold Handling

Cupola and Furnace Chargers

Sand Conditioning Systems

Patented & Patents Pending

MODERN EQUIPMENT COMPANY

PORT WASHINGTON, WIS., DEPT. 165

MODERN EQUIPMENT CO.

Obituary

HUTTON H. HALEY, 53, Detroit district sales representative of the American Foundry Equipment Co., Mishawaka, Ind., and head of Hutton W. Haley & Associates, Detroit, died March 1 in Providence hospital, Detroit, following an operation. Mr. Haley started his business life as a broker of foundry supplies in Kansas City, Mo. In 1911 he joined the Sand Mixing Machine

Hutton H. Haley

Co., which later became the American Foundry Equipment Co., and was active with that organization for almost 30 years. He was appointed sales manager in 1926, but resigned a year later to take charge of sales in the Detroit territory. A prominent figure in affairs of the Detroit chapter of the American Foundrymen's association, he perhaps had a wider acquaintanceship among foundrymen in Eastern Michigan than any other individual.

* * *

Joseph E. Brown, 74, president, Reed Foundry & Machine Co., Kalamazoo, Mich., died at his home in that city recently.

* * *

Daniel W. Begley, 70, for 43 years clerk for the National Malleable & Steel Castings Co., Cleveland, died at his home in Cleveland Heights, O., recently. Mr. Begley retired in 1938.

* * *

Arthur H. Anthony, 59, president, Massillon Steel Casting Co., Massillon, O., died Feb. 29, at St. Petersburg, Fla., after an emergency operation. Mr. Anthony was born in 1881 in Cleveland, and was graduated from Case School of Applied Science, with a degree of mechanical engineering. After graduation he entered the employ of the National Tube Co., McKeesport, Pa., and in 1914, resigned to become chief engineer, Fort Pitt Steel Casting Co., McKeesport. In 1917 he went to Massillon, O., where with the late Charles E. Nordfelt he founded the Massillon Steel Casting Co. Until 1939 Mr. Anthony was vice president and general manager and at that time succeeded R. M. Rumbel to the presidency.

* * *

Frank C. Blair, 89, Waukesha, Wis., from 1880 until his retirement in 1928, owner and manager of the Blair Foundry established by his father, William Blair, died in that city, March 5.

* * *

Charles Arthur White, age 58, secretary-treasurer, Leeds & Northrup Co., Philadelphia, died March 2, at Germantown hospital. Mr. White joined the Leeds & Northrup company in 1920.

* * *

Stephan J. Wissing, 47, secretary, Gluntz Brass & Aluminum Foundry Co., Cleveland, died Feb. 28 at his home in that city. Mr. Wissing has been connected with the Gluntz company for the past 10 years.

* * *

Vital Ouellette, 73, for 25 years president of Grant Bros. Foundry Co., Detroit, died in that city recently following a short illness. Mr. Ouellette was born in Stony Point, Ont., Canada, and went to Detroit 50 years ago to take up a job as molder for the Michigan Stove Co., later becoming superintendent there.

* * *

Charles G. Ferrell, 86, president, Ferrell Brass Works, Los Angeles, died recently in that city. Mr. Ferrell built two foundries, one at Butte, Mont., the other at Salt Lake City, Utah. After selling the two plants he moved to Los Angeles to retire 21 years ago. However, he soon returned to his profession and built the Ferrell Brass Works.

* * *

David C. Jones, vice president and general manager, the Lunkenheimer Co., Cincinnati, died March 11. Mr. Jones was born in Cincinnati in 1876 and entered the employ of the Lunkenheimer company Jan. 1, 1894. He has been identified prominently with industrial and banking activities in Cincinnati and also served as president of the American Supply & Machinery Manufacturers' association.

* * *

Clayton A. Farmer, foundry superintendent, Acme Foundry Corp., Cleveland, died recently in Cleveland. Mr. Farmer served his apprenticeship with the A. Buch's Son's Mfg. Co., Elizabethtown, Pa., and later served as a foundry executive with that company following specialization in cupola practice and construction and demonstration of molding machines. He was connected for varying periods with Clark Bros., Olean, N. Y.; E. C. Stearns Co., Syracuse, N. Y.; Dobbie Foundry Co., Niagara Falls, N. Y.; and the Green Fuel Economizer Co., Beacon, N. Y.

* * *

Julian B. Greenstreet, 54, for the past 7 years superintendent foundry division Textile Machine Works,

Julian B. Greenstreet

Reading, Pa., died in that city March 10. Mr. Greenstreet was born in Carolina county, Virginia, March 9, 1886. He attended public school and business college in Baltimore and at 15 commenced to work with the Maryland Wheel Co. Four years later he went to the Central Car Wheel Co., Pittsburgh and took up a correspondence course in mechanical drawing. He had charge of melting and inspection for the Butler Car Wheel Co., and the Pennsylvania Car Wheel Co. Returning to Baltimore he served as shipping clerk and foreman of various departments in the Flynn & Emrich Co., plant. He was connected with Levering Bros., York, Pa., Jones Hollow Ware Co., Baltimore, and the Fairmount Foundry Co., Philadelphia. When the Link-Belt Co., Chicago, acquired the Fairmount properties in 1920 he was appointed general superintendent. He became superintendent of the foundry division Textile Machine Works, Reading, Pa., in 1933. Active for many years in the Philadelphia Foundrymen's association, he served as president in 1932. He also was a past president and a member of the executive committee of the Reading Foundrymen's association.

Safety begins at the top and management and supervisory staffs must observe and follow all safety practices set up.

Opportunities

The opportunities for contacting once again your many foundrymen friends, getting new ideas from the exhibits, and learning from the technical discussions will be yours during the coming convention.

The opportunities thus afforded to manufacturers and suppliers of foundry equipment and accessories are obvious.

44th ANNUAL A. F. A. CONVENTION

International Amphitheatre . . . CHICAGO . . . May 4-6-7-8-9-10, 1940

May Pre-Convention Issue

In the hands of foundrymen readers well in advance of the opening of the convention, the May issue of **THE FOUNDRY** will present a complete preview of the convention—program of meetings, technical sessions, plant visitations, and social events.

To all those who sell to the foundry industry, whether supplies, accessories or equipment, the May Pre-Convention issue of **THE FOUNDRY** offers an outstanding opportunity to present a special message to all foundrymen, coupled with an invitation to call and inspect particular displays at the convention.

The reservation of advertising space in the May Pre-Convention issue of **THE FOUNDRY** may be made from now until April 9.

June Post-Convention Issue

To those who have attended the Convention, and while the many instructive things they have seen and heard are still fresh in mind, the June Post-Convention issue of **THE FOUNDRY** will bring a complete story of the show and will become a permanent printed record of the 44th Annual A.F.A. Convention.

Your sales message in this issue will refresh the minds of the foundrymen you saw in Chicago, and those who were unable to attend will have an opportunity to read your story. The keen interest in the Post-Convention issue gives added emphasis to your sales message.

The reservation of advertising space in the June Post-Convention issue of **THE FOUNDRY** may be made from now until May 13.

The Foundry

ADVERTISING DEPARTMENT · PENTON BUILDING · CLEVELAND

AVOID DEFECTS IN NONFERROUS FOUNDRY

(*Continued from page* 33)

has not been fed properly. Frequently shrinkage defects do not exhibit a cracked condition, but when machining takes place, an open structure is discovered beneath the skin. As more metal is removed from the surface, this structure becomes even more open. A fracture through this section of metal will show the typical lack of feed and indicate to the foundryman that on future castings off that pattern, he must provide adequate feeding at that point.

Shrinkage defects may arise from three major causes; lack of feeding, due to inadequate size of riser; lack of feeding due to improper temperature conditions; or resistance of a hard core or mold section to the shrinkage of the casting, thus causing excessive shrinkage strains and possibly even reaching the point of causing cracks.

The second defect under this first major group is caused by gassed metal. This definitely is the result of improper melting practice, discussed thoroughly heretofore. Casting with these defects will show little gas holes beneath the skin. Frequently throughout a section of the casting the gas holes will be spherical in shape and usually of a bright color inside. The holes have been filled with a nonoxidizing gas, which does not discolor the inside of the bubble. These holes may be large or small. Frequently they are located only on the top side of the casting. The bottom side of the casting frees itself of gas as it solidifies. The gas rises up into the top side where it is entrapped by the solidifying metal. A fracture test of castings that have been gassed definitely will exhibit the typical gas holes described, and also will show gas holes are more predominant at the last surface to freeze, or at the point in the casting last to freeze, indicating that the gas has been forced through that which first froze into that point which cooled last. This is a typical indication that the trouble lies in gases absorbed or dissolved in the metal poured into the mold.

Alloys Tend To Segregation

The third type of defect of this first major group is the appearance of the segregated constituents of the metal concentrated at the surface of the casting or at the bottom of the casting as instanced in some of the high lead alloys, or the high tin lead alloys. The low melting constituent frequently is forced to the surface by gas absorption. These gases provide microscopical passage ways through which these low melting point constituents travel freely to the surface and thereby concentrate their presence at the surface. The correction for this, of course, is the correction for gas absorption, but there are instances where the concentration of the lead in the high lead alloys is the result of improper mixture; over oxidation or under oxidation; improper use of deoxidizing agents and fluxes.

All of these have been described heretofore, but this type of defect persists so that it really is an important one for the foundryman to consider. A customer receiving a casting very high in lead on the surface at one end, and red metal at the other, certainly is entitled to feel that he is receiving a defective casting. The foundryman should scrap such work, remelt it, put it through the proper process, and produce good castings with the constituents uniformly distributed throughout the section.

The fourth type of defects in this major group results from nonadher-

MAEHLER CORE OVENS

INCREASE PRODUCTION: Maehler Core Ovens with their recirculating system of heat have proved, time and again, their ability to reduce baking time as much as 50%. This means more loads per day of better cores.

LOWER FUEL COST: Heat recirculated the Maehler way greatly minimizes stack losses, for the heated air is used over and over. In a Maehler Air-heat system the better fuels can be burned with less over-all-baking costs.

UNIFORM CORES: Large, small, light, heavy cores can be baked at the same time — all perfectly. There is no compromise between overbaking and underbaking. There is less waste in both cores and castings with Maehler equipment.

THERE'S no guesswork about core baking when you use Maehler recirculative type core ovens. The heat is produced outside the oven unit and distributed by forced circulation throughout the core load. Temperatures are always under completely automatic control. These Maehler features give you "controlled" cores, perfectly baked cores every load—PLUS fuel savings and increased production. These advantages have been secured in every instance where Maehler recirculative type heating equipment has replaced old style ovens. If you want these same advantages, write to Maehler today for a survey of your present oven efficiency.

50th ANNIVERSARY 1890 1940 MAEHLER

THE PAUL MAEHLER COMPANY
2200 W. Lake Street • Chicago, Ill.

ence to specified formula. In other words, variance from the composition desired. Little or no excuse exists today for the foundrymen to offer castings that vary outside the reasonable limits of modern specifications from the desired composition. Ingot metals are now available from the ingot metal manufacturers that are very close to the standard demanded; in fact, so close that no foundryman should have any fear of producing castings outside the specified limits if he uses due diligence to compensate for volatilization or vaporization during the melting, and pouring processes.

Control of the chemical content of the different compositions regularly produced in the modern brass foundry has been simplified materially by the high grade of raw materials made available by the ingot metal producers. The accuracy of their chemical content is such that any foundryman can establish a standard practice in his melting department that will give him a very high degree of uniformity of product, and consequent accuracy to formula. Melting conditions influence materially almost all types of defects, but under the major heading of metal and melting conditions, these four are the major types of defects.

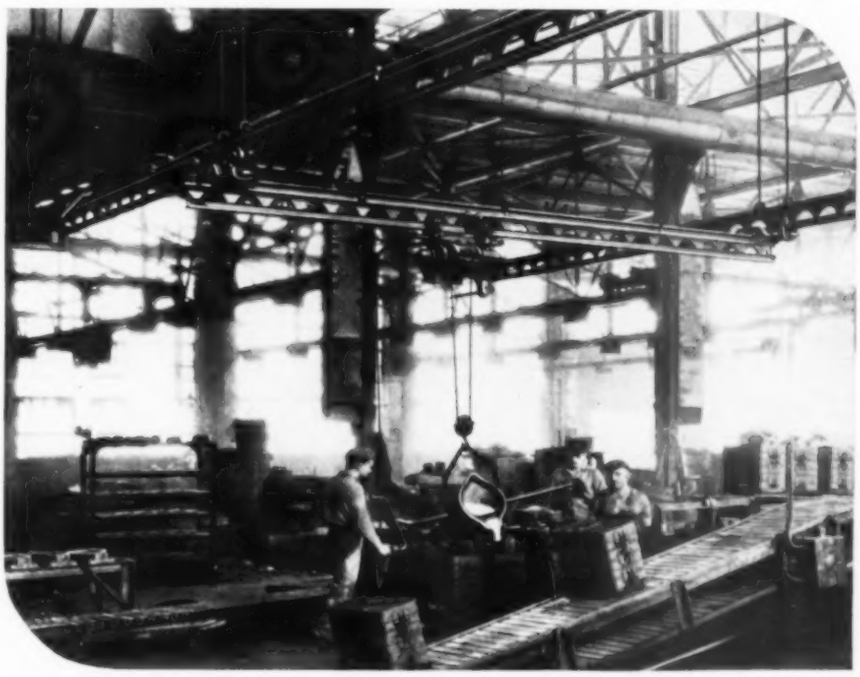
Mold Causes Defects

A vast number of different defects come back to the molding either to molding practice, or to pattern design or equipment. Probably the most common defect resulting directly from molding is sand holes. These actually are cavities in the castings in which pieces of sand are lodged, the same having been washed there from some part of the mold or core. Usually the points at which the sand was removed have been filled with metal and if that point was part of the casting, we have a lump on the casting where the sand came from. Thus we have two defects. The lump is removed easily in many instances by chipping hammers, but the cavity from which the sand has been removed can hardly be filled up in a satisfactory manner to produce a first class casting.

Sometimes the sand in these cavities comes from the gates, or is even carried down the sprue at the moment of the entrance of the stream of metal at the commencement of pouring. It will be seen from this that not only does this type of defect result from molding, but it also may result from bad pouring, since pouring the metal in such a way as to tear the sand loose and carry it into the mold cavity would result in this type of defect. However, this defect more commonly is the result of lack of attention to detail in the molding, or the lack of care in handling cores. Frequently, the piece of sand may be from one of the cores, loosened during the process of handling the cores to set them in the mold. Sometimes this core setting process is so carelessly done that pieces of sand are knocked from the core print, and loosened sufficiently so that the incoming metal can wash that loosened sand into the mold cavity to produce sand holes.

A crush is another type of defect caused by molding conditions. This is a displacement of sand by the action of closing the mold. The mold is not closed properly, or the cores do not fit the prints, or the molding has been done by those who do not appreciate the importance of making due allowances for change in dimensions in molding parts in the case of dry sand molds, or in the case of molds assembled from a large number of dried sand parts.

The type of defect known as a swell has little excuse under modern knowledge of molding practice. It consists of an increase in the dimensions of the casting due to the swelling of the casting while the metal is molten, and under the pressure resulting from static head produced by the risers tending to force metal into the mold. This force swells the casting because the



MAKES POURING EASIER AND SAFER
. . . *and* EARNS BIG DIVIDENDS

With Cleveland Tramrail, pouring is made easier and safer in hundreds of progressive foundries and handling time drastically reduced.

Cleveland Tramrail eliminates much of the usual rehandling through use of transfer bridges and interlocks which permit taking the hot metal direct from cupola to pouring. The same Tramrail system usually can be used for handling molds, cupola charging, etc.

Just as Cleveland Tramrail is helping the dividends for others it can help you too.

CLEVELAND TRAMRAIL DIVISION
THE CLEVELAND CRANE & ENGINEERING CO.
1155 Depot Street Wickliffe, Ohio

CLEVELAND TRAMRAIL
OVERHEAD MATERIALS HANDLING EQUIPMENT
Other products: CLEVELAND CRANES and STEELWELD MACHINERY

mold is too soft to resist. Soft ramming no longer is excusable. Improper backing up of a mold against this pressure is no longer excusable in the face of modern understanding of the engineering principles entailed in this swelling operation.

Position during the process of filling the mold and the subsequent solidification of the metal does influence the pressure exerted on certain points in the mold, and consequently varies the amount of swelling that might take place at some particular point. There is little excuse for swollen castings, and yet a great number are made and frequently shipped. When they do not fit the jig there is complaint on the part of the customer. When made by a captive foundry, the machine shop does not do much about it except to tell the foundry foreman there is something wrong. Some of the castings fit the jigs and some of them do not.

A shift in the casting, another type of defect in this class, is indicated by a mismatch of the two parts of the castings located respectively in the cope and drag. Either the molding equipment allows the shift in these two parts of the mold or else the pattern equipment permits of this error and either one should be corrected at once. The answer is in either case, good equipment intelligently used.

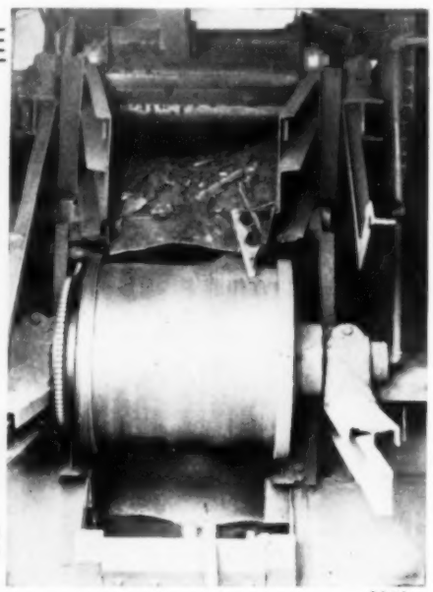
Variation in wall thickness, another type of defect in this class, is directly traceable to molding practice unless it is an error of the patternmaker, which is very unusual. A round casting with a thick wall on one side and a thin wall on the other results from an eccentric core. This type of defect is not at all uncommon. Such castings should be rejected without question. Concentricity of cores is just as definitely a part of a good casting as the absence of sand holes or absence of blow holes, or the like. Uniformity of dimensions to pattern is a very definite part of a good casting. Castings that do not conform to pattern are defective. Castings that have thick walls on one side and thin walls on the other are traceable directly to misuse of the pattern in the process of molding, or lack of provision during the molding process for proper support of different parts of the mold against stresses produced during pouring and during the solidification of metal after pouring. The molding process must include provision of adequate anchors for cores and adequate support for all parts of molds and cores so that no change in their position will occur after they have been once placed in the desired position.

Sand Should Be Vented

Little irregular worm-shaped depressions on the casting surface, usually near or in the vicinity of the gate and in the case of some alloys frequently filled with zinc oxide or metal oxides, usually are traceable to lack of permeability in the sand or the lack of proper venting in the mold. With yellow brass the defects usually result from the way the metal has been poured into the mold; or in other words, the speed at which the mold was filled. The correction for this has been covered in previous articles.

Burning into the sand of the mold or the core are types of defects also definitely traceable to molding practice, or to core making practice, which really is part of the molding practice. This type of defect reflects the surfaces provided on the core or on the mold. It is influenced by the amount of pressure exerted against that surface by the hot metal in the mold and risers, and it is also influenced by the temperature at which the metal is poured, the mass of metal in the mold and the amount of erosive or scouring effect produced by the type of gating used, and the force of the pouring operation. A num-

A Difficult SAND RECLAIMING Job Licked by Stearns MAGNETIC



HOW to eliminate the scrap metal from hot sand coming off of a steel conveyor was a problem in the foundry division of a prominent automobile maker. And this sand was hot! Conveyor belts were out of the question.

STEARNS Magnetic engineers were consulted and made a study of this problem. Out of their many years of experience in solving foundry problems they installed this specially designed and constructed magnetic drum. It's doing a swell job!

Avail yourself of STEARNS Magnetic advice on sand reconditioning problems or other jobs involving the removal of iron. We can give you a positive, automatic, time and labor saving method with STEARNS Magnetic equipment.

We will be glad to mail this folder or other Bulletins on Magnetic Separators. Write for them.

STEARNS MAGNETIC MANUFACTURING CO.
662 S. 28th St., Milwaukee, Wis.

ber of factors enter into this group of defects—burning into the mold or core surface. The surface obviously cannot be too tight, otherwise permeability is lost. It cannot be easily combustible if there is a large mass of metal at high temperature present in the mold. Therefore, if castings exhibit this burnt-in condition of a skin having part metal and part sand, either on the core surface, or on the mold surface, a study must be made to determine which of the several factors are responsible for the condition, and the correction applied on all future castings. The method of correcting for this type of defect has been discussed in the preceding article which appeared in the March issue of THE FOUNDRY.

This is the fifth of a series by N. K. B. Patch on defects in nonferrous castings with suggested corrective measures. The first appeared in the December, 1939 issue, and succeeding ones in the January, February, and March, 1940 issues of THE FOUNDRY.

THE EDITORS.

Discusses Enameling

Porcelain Enamel institute, 612 North Michigan avenue, Chicago, recently has made available a 183-page book entitled, "Proceedings of the Fourth Annual Forum" which contains not only all the papers presented at its meeting at Ohio State university in October 1939, but all of the discussions in connection with those papers. The book contains 20 papers dealing with various phases of enamelling, and copies may be secured from the Porcelain Enamel institute for $2.

Adventures of Bill

(*Concluded from page* 50)

one of the local foundries. Several years later when the old vessel was mounted on a concrete foundation, the guns were dumped on the dock.

"'That type of gun,' the Captain speaking, 'is obsolete of course for many years. Known as a carronade, Ever hear the word before?' I assured him the word was quite familiar. The first guns of the type were made at the Carron Iron Works in Falkirk, Scotland. 'How is it,' the Captain asked, 'that you know about the Carron Iron Works?'

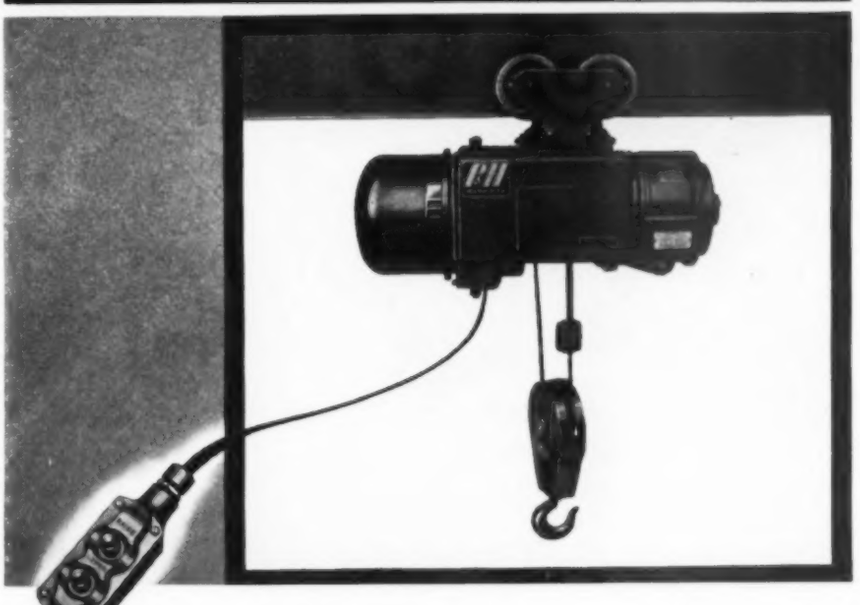
"I said I saw nothing remarkable about the statement. 'Here you are,' I said, 'a master mariner. You are familiar with all the ports on the Great Lakes and all the great ocean ports practically all over the world. You know the depth of water over the bars at high and low tide. You know the effect and direction of the trade winds. You have had experience with hurricanes, typhoons, monsoons and the roaring pampero off the coast of South America. You could take a ship out of New York tomorrow and in a definite number of days you could bring her into London, Bordeaux, the Cape, Kowloon, Canton, Buenos Aires or Antofagasta as readily and as surely as you could walk from here to the post office. That's your business. I am a foundryman. Every thing connected with the industry is my business."

"Funny business," I said. "Confucius say, 'Not every man who monkeys with cannon is big shot!' "

Officers Elected

Propeller Fan Manufacturers association held its annual meeting in Cleveland recently and elected the following as officers for 1940: A. R. Stephan, DeBothezat Ventilating Equipment Co., president; M. W. Bauer, Aerovent Fan Co., vice president; V. C. Shetler, secretary-treasurer. Association offices are in the General Motors building, Detroit.

P&H HEVI-LIFT HOISTS



Variable Speed Control with PUSH-BUTTON for Foundry Use!

• Now, you can simplify many of your foundry operations with the new variable speed push-button control, available on P&H Electric Hoists. The operator can speed up or slow down lifting and lowering movements entirely by button pressure —"inching" loads at creeping speeds where necessary. It assures the utmost flexibility in handling—increases the efficiency of foundry operations from the handling of raw materials to the finished product. Variable speed push-button control may also be applied to floor controlled cranes. For full details, ask us to send you Bulletin H-5.

General Offices: 4405 West National Avenue, Milwaukee, Wisconsin

HARNISCHFEGER CORPORATION

HOISTS • WELDING ELECTRODES • MOTORS P&H EXCAVATORS • ELECTRIC CRANES • ARC WELDERS

FUNDAMENTALS OF CUPOLA PRACTICE

(*Continued from page* 32)

interest lies in the field of high strength irons in which the carbon level generally is low. With a 60 per cent steel charge, the carbon content of the cupola charge will be close to 1.35 per cent while the carbon content of the molten iron will be about 2.50 per cent, provided the solubility rate of the coke in molten iron is low and other factors bearing on carbon pick-up are favorable. If the solubility rate of the coke in molten iron is high and if other factors bearing on carbon pick-up are unfavorable, the final carbon may be as much as 3.60 per cent, a carbon pick-up of 2.25 per cent as against 1.15 per cent.

A number of theories have been advanced concerning cokes of low solubility rate in cast iron, such as, they are *high ash* or *hard and dense* or that the alumina content of the coke ash is important or that the amount of white cell space is low. Up to the present time none of these theories has been fully confirmed by operating data nor has any laboratory test been devised to tell whether one coke may be more satisfactory than another. The author's method of determining the suitability of a coke is to use it in a standard method of operating and find out what carbons are reported by the laboratory. For example, with a suitable coke and good operating technique a cupola charge containing 60 per cent steel (carbon content of charge about 1.35 per cent) should produce an iron with a carbon content as low as 2.50 per cent.

In most localities steel scrap costs more than cast scrap and when its deficiency in silicon content is corrected by using silvery pig, silicon briquets or lump ferrosilicon, the difference in cost increases. The use of 10 per cent steel scrap in the charge when cast iron scrap might have been used means that one charge costs from $0.50 to $1 more than the other. When the amount of steel in the cupola charge exceeds 60 to 70 per cent, flexibility in using up all sprues and gates is sacrificed and the cost of the charge increases quite rapidly.

Control Pouring Temperature

Although tapping temperature is important, the most important temperature in a foundry is the *pouring temperature*. It is impractical to tap metal from a furnace into a ladle and transfer the ladle to the molding floor without some loss of temperature. This loss of temperature is seldom less than 150 degrees Fahr. and may approach 400 degrees Fahr. It is desirable to keep this unavoidable loss down to the least possible amount. There is a metal temperature loss (a) when the cupola spout is made wide and shallow and without a cover, (b) when the ladle refractories are at a lower temperature than the metal, (c) when metal is transferred from ladle to ladle before it reaches the mold, (d) when cold materials are added to the ladle, (e) when ladle refractories are thin.

Frequently the difference between success and failure in the foundry is in metal handling technique.

Some good practice essentials are as follows:

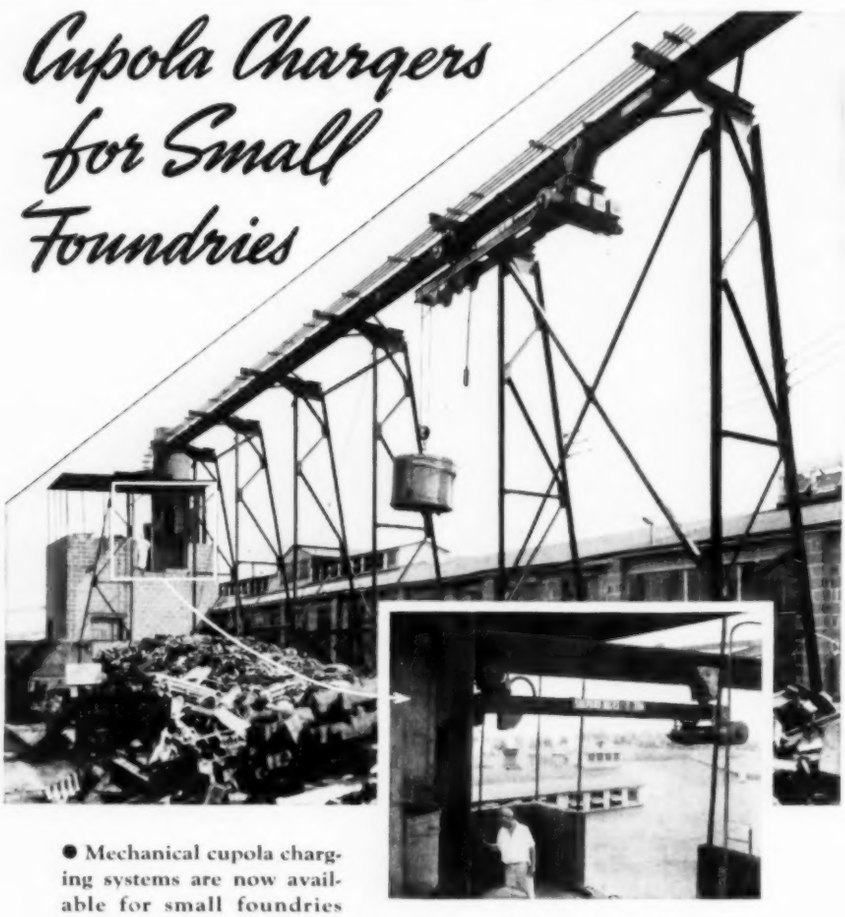
1. Size and weights of materials in the coke and iron charge should be in good relationship to the size of the cupola.

2. Cupola bottom sand should be screened, tempered and bonded.

3. Height of the bed coke should be adjusted to suit the type of operation.

4. Time allowed for burning in the bed should be long enough to allow the sand bottom and well refractories to be preheated to the maximum possible temperature.

5. Cupola should be slagged to



● Mechanical cupola charging systems are now available for small foundries with daily melts of 15 to 30 tons.

No need for an expensive cupola enclosure or charging floor. An inexpensive runway to carry the charger and an operator's platform at the cupola door is all the construction necessary.

Foundrymen who seek better metal at lower costs—no matter what the daily tonnage may be—can obtain complete information by writing to Montour Falls.

A COMPLETE LINE OF CRANES & HOISTS

SHEPARD NILES CRANE & HOIST CORP.

360 SCHUYLER AVENUE . . . MONTOUR FALLS, N. Y.

produce hotter and cleaner metal.

6. Method of tapping the cupola should be controlled accurately if a uniform quality product is required.

7. Use enough air so that the cupola will melt at not less than its normal melting rate.

8. Try to hold the metal temperature loss in the cupola spout and metal handling circuit to 150 degrees Fahr.

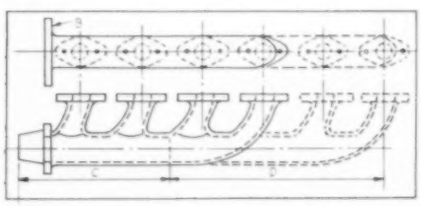
9. Whenever possible use a ladle that will hold two or more cupola charges and avoid large cupola charges when metal is tapped into small ladles.

10. A good guide to effective cupola practice is to check the iron for total carbon and tensile strength.

Increase Length of Engine Casting

By J. R. Nichols

In the accompanying illustration of an internal combustion engine exhaust manifold, the full lines indicate a manifold for a 4-cylinder engine for which a special pattern with corebox already was in existence. A similar manifold for a 6-cylinder engine, with branches same length as 4-cylinder unit was required at short notice. As there was not time to make a new pattern, a casting successfully was obtained by adoption of the following method.



Illustrating method of molding and coring a 6-branch manifold from a 4-branch pattern and corebox

A mold was made from the existing 4-cylinder pattern with room left in the flask for the extra length of the 6-cylinder manifold. The flange *B* was removed and the pattern moved along to bring the two branches at the flange end into the branches. At the same time the two cavities left by the other two branches which served to make the mold for the 6-cylinder job were bedded in cope and drag.

This completed the mold. The core was made in two parts by ramming the 4-cylinder corebox from the open or flanged end, but stopped off at the dotted line for one part The full length of the corebox as indicated at *D*, less the core print was utilized for the other part.

The two cores *C* and *D* were placed in the mold as shown. A complete 6-cylinder manifold mold was made up and a satisfactory casting obtained much more quickly than would have been the case had a new pattern been absolutely necessary. Of course, at the time this was an emergency one-off job. Later a special pattern was made.

Division of simplified practice, National bureau of standards, Washington, is making available simplified practice recommendation for large tube cast iron radiators which lists 17 sizes ranging from 4 to 7 tubes, and in varying heights. That is a reduction from the previous 33 sizes. The recommendation is identified as Simplified Practice Recommendation R174-40.

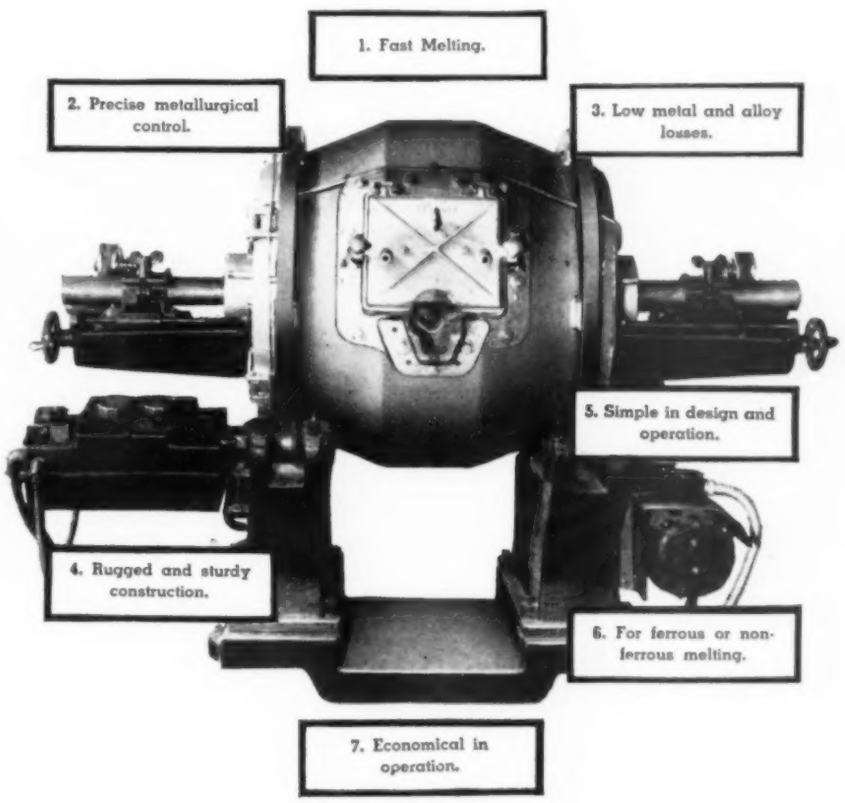
Hold Meeting

Latest practices and developments in various applications of the oxy-acetylene process in American industry will be the subject under consideration at the annual convention of the International Acetylene association to be held April 10 to 12, Milwaukee, with headquarters at Hotel Schroeder.

THE UNIVERSAL MELTING TOOL

THAT CUTS COSTS • INCREASES SERVICE • IMPROVES PRODUCTS

During the last 22 years the Detroit Rocking Electric Furnace has established itself as the universal melting tool among the country's foremost metallurgists and foundrymen. It makes possible precise control of time and temperature thus insuring accuracy of analysis. And it melts easily and quickly almost any size heat of any ferrous or non-ferrous metal.


1. Fast Melting.
2. Precise metallurgical control.
3. Low metal and alloy losses.
5. Simple in design and operation.
4. Rugged and sturdy construction.
6. For ferrous or non-ferrous melting.
7. Economical in operation.

DETROIT

ROCKING ELECTRIC FURNACE

DIVISION OF KUHLMAN ELECTRIC CO., BAY CITY, MICH. AGENTS IN 40 CITIES

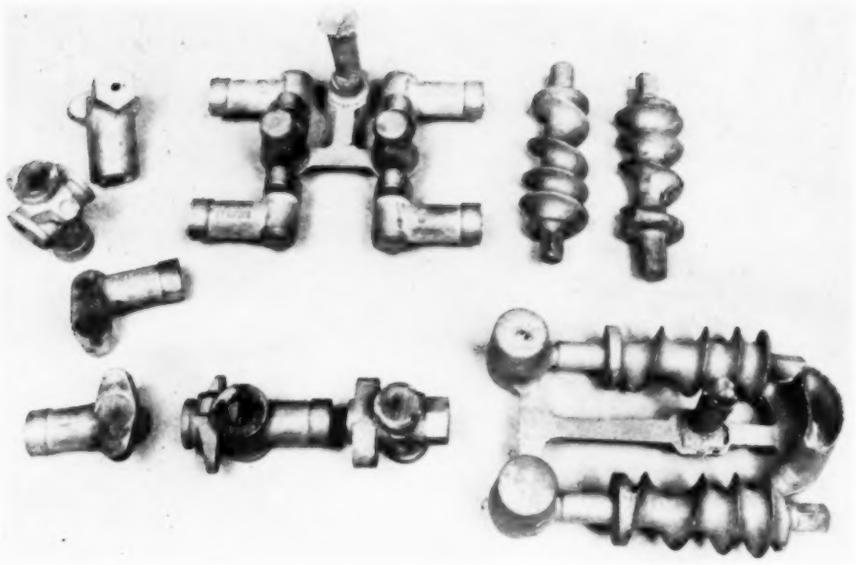


Fig. 8—Method of gating some alloy iron castings

RAPID DELIVERY IS JOBBING FOUNDRY PRIDE

(*Continued from page* 26)

shipping clerk and includes any necessary shipping instructions. The shipping clerk makes out a 4 x 6 card for the job, shown in Fig. 5, and files both in a quick reference file, under customer name. The cards shown in Fig. 5 have tabs at the top edge staggered in conventional index form and the pattern number is entered on the tab. If the pattern number ends in *O* the card has tab on the extreme left side. If it ends in 1, 2, 3 etc. the tab moves over to the right accordingly. It will be noted that this card also constitutes a daily record of castings made and castings good. When the job is shipped complete the card goes into a permanent file for future reference to performance on the job.

The pattern clerk having a tag (Fig. 6) made out for a job, gets the pattern equipment together and checks core boxes against pattern. He then attaches the tag to the pattern, but removes section marked *Complete*. The core order is made out on a form depicted in Fig. 2. This form is in two colors—gray for cupola iron and blue for electric furnace iron, since separate cost records are maintained. As may be observed, the form is perforated so that it may be torn to provide two sections 2½ x 5 inches. Entry spaces on both sections show customer symbol, date, pattern and corebox number, castings ordered, cores required and core making piece price. The left section, after the job is made, goes to the timekeeper and then is returned to the coremaker. The other section is used to check the core price.

In actual practice, to expedite production, the core order is made out and sent to the core room with the boxes as soon as they have been checked against the pattern. Then the clerk takes care of the molder's order.

The tag section marked *Complete*, having been torn off enters a 4 compartment box on the production manager's desk. This box, known as the *Tickler* is about 10 x 14 inches by 2 inches deep, and shown in Fig. 10. These stubs, on which is entered the daily production, serve to follow the progress of the job in the foundry and show at a glance any jobs that are delayed for any reason.

Patterns with tags attached are placed on racks from which the foremen assign them to molders, at noon daily. Selection is on the basis of the aptitude of the molder for type of work and upon the scheduled delivery date. The foreman giving out the job writes the molder's name both on the molder's order and on the stub marked *In Sand*. He tears off the latter which goes to the shipping clerk. He then records the molder's name on the job producti card (Fig. 5), and gives the stub a clerk who checks the price and bonus to insure against errors.

Keeps Time for Pay Roll

At the end of each molding da the molder records his time and molds for the day. This is picked up daily and brought into the office From it the pieces made are entere on a "trimming ticket," shown Fig. 4. These tickets are also in tv colors to differentiate between cupola and electric furnace iron. The shipping clerk retains them until the job is shipped, when he records weights and quantities. These tickets then constitute the payroll starting point, and come through, day by day as the production on a job progresses. When the job is complete the last trimming ticket is marked with a large *C*, and given to the pattern clerk, who removes the *Complete* stub from the *tickler* box and uses it to collect the pattern and core box equipment.

While the foregoing description may lead to the opinion that the system is complicated and unwieldy, and takes up a great deal of time, just the reverse is true since each record has a specific function which

(*Concluded on page* 96)

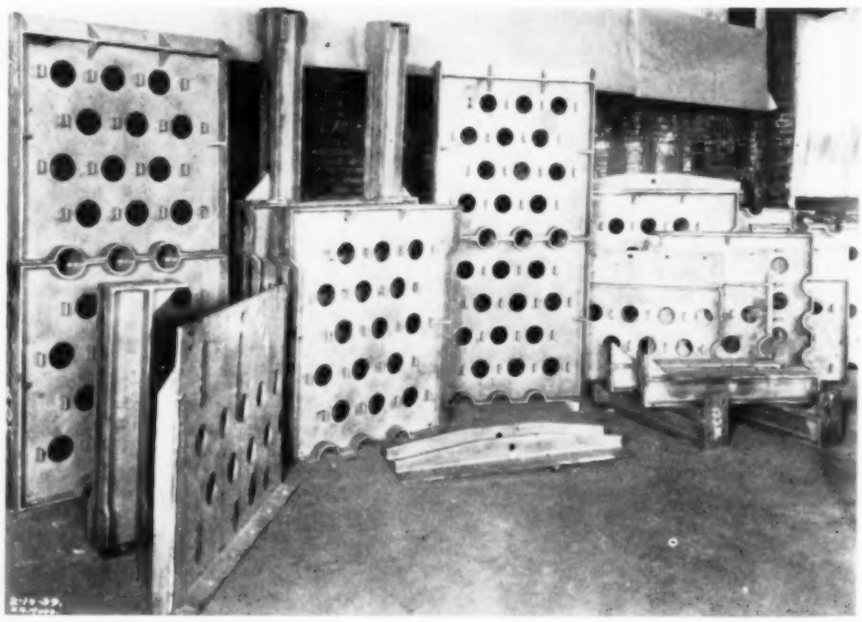
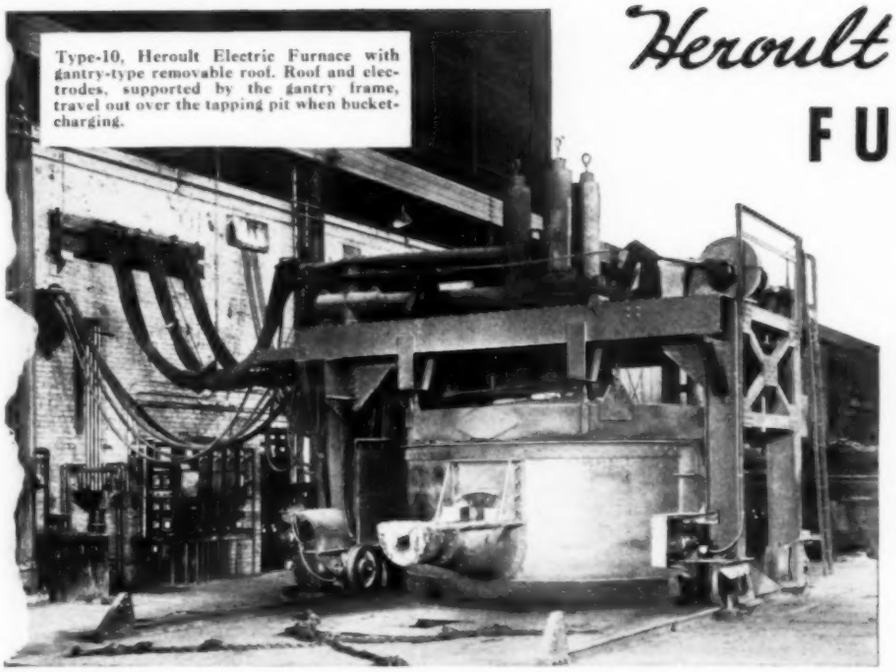


Fig. 9—Group of alloy iron castings which were shipped to South Africa



Type-10, Heroult Electric Furnace with gantry-type removable roof. Roof and electrodes, supported by the gantry frame, travel out over the tapping pit when bucket-charging.

Heroult ELECTRIC FURNACES

AMERICAN Bridge Company offers an improved series of Heroult type electric furnaces especially designed for effective melting and refining of ferrous materials, and particularly suited to produce high-grade alloy and stainless steels, iron or steel castings.

Heroult Furnaces are sturdily built, and equipped with the most modern electrical and mechanical appliances for efficient, economical and safe operation. Dependent on size and operating conditions, they are adaptable to hand, chute, machine or overhead drop-bottom bucket charging. Available capacities range from ½ to 100 tons.

You are invited to call freely upon the specialized experience of our furnace engineers.

AMERICAN BRIDGE COMPANY

General Offices: Pittsburgh, Pa.

Offices in New York, Philadelphia, Chicago and other principal cities.
Columbia Steel Company, San Francisco, *Pacific Coast Distributors*
United States Steel Export Company, New York

UNITED STATES STEEL

The Ideal Material for Sand Blasting

. . . . . it cleans fast
. . . . . *at reduced cost*

FLINT SHOT gives a class of finish impossible to duplicate with any other forms of abrasives. Its round, pearlike granules are as hard and sharp as flint. Does not split up, only wears down and can be used over and over again many times. It flows freely, requiring less air power. FLINT SHOT LASTS. Relatively dustless.

Try FLINT SHOT and you'll be convinced.

Engineering Service Gratis.

Three plants to meet your needs with dispatch.

Washed, Dried and Screened Special Sands for
Steel Moulding
Furnace Bottoms
Cores, Openers
And Silica Flour

OTTAWA SILICA COMPANY

Ottawa, Illinois

(*Concluded from page* 94)

requires the minimum time in determining the particular stage of any job. The time necessary to make out and maintain the records is com-

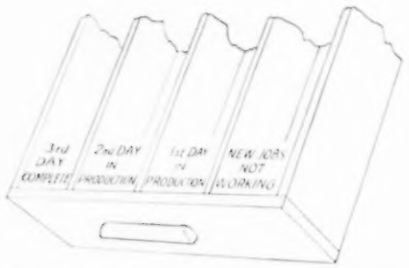


Fig. 10—Sketch of a 4-compartment tickler file maintained for production manager

paratively short. The latter operations have not necessitated any increase in clerical force since they are carried on as part of the regular routine of the various individuals mentioned without any difficulty being encountered.

To Give Management Course at Iowa

University of Iowa, Iowa City, Iowa, is offering a special three-week course from June 10 to 28, 1940, for those interested in comprehensive training in motion and time study, waste elimination, cost reduction, and related subjects. The course, offered for the first time last year, was attended by executives and engineers from 25 different industries in the United States and Canada.

The summer management course will be under the direction of Ralph M. Barnes. Assisting in the course will be 7 university instructors and lecturers and 8 visiting managers and engineers from industry who will conduct forums on practical production problems.

Teaching staff and university lecturers include: Ralph M. Barnes, director of summer management course, and professor of industrial engineering, University of Iowa; L. P. Persing, supervisor of wage payment, Fort Wayne works, General Electric Co., Fort Wayne, Ind.; J. V. Balch, research engineering and instructor in industrial engineering, University of Iowa; Robert E. Box, engineer in charge of industrial engineering laboratory equipment, University of Iowa; Lester Thonsen, professor of speech, College of the City of New York, New York; W. L. Daykin, assistant professor of economics, University of Iowa; Dewey Stuit, associate professor of psychology, University of Iowa; C. M. Updergraff, professor of law, University of Iowa; and A. C. Baird, professor of speech, University of Iowa.

Visiting lecturers and forum leaders will be: John A. Aldridge, executive operating staff, Sears, Roebuck & Co., Chicago; L. A. Bradley, manager, University of Iowa Laundry, Iowa City, Iowa; W. E. Crotsley, production manager, International Business Machines Corp., Endicott, N. Y.; Erick G. Erickson, chief engineer, Buddy "L" Co., East Moline, Ill.; Lillian M. Gilbreth, president, Gilbreth, Inc., Montclair, N. J., and professor of management, Purdue university, Lafayette, Ind.; W. F. Heising, superintendent of manufacturing, W. A. Sheaffer Pen Co., Fort Madison, Iowa; and J. K. Louden, supervisor of standards control division, Owens-Illinois Glass Co., Toledo, O.

Steel Founders Hold Annual Meeting

More than 150 steel foundrymen attended the annual meeting of the Steel Founders' Society of America, held at the Edgewater Beach hotel, Chicago, Feb. 13 to 15. Business sessions were opened by D. C. Bakewell, president of the society, and numerous committee reports were presented. At the conclusion of a luncheon held on Feb. 14, the Frederick A. Lorenz memorial medal was presented to Frank M. Robbins, Ross-Meehan Foundries, Chattanooga, Tenn., and retiring president of the society, for his generous devotion of time, thought and energy to the society's affairs. Mr. Robbins also received a hand engrossed certificate of award attesting to the honor conferred upon him. Speakers at the afternoon session included John W. Hill, Hill & Knowlton, Cleveland R. L. Collier, secretary of the society; Oliver E. Mount, American Steel Foundries, Chicago; Kenneth F. Ode, Falk Corp., Milwaukee, and Paul H. Harlan, Electric Steel Castings Co., Indianapolis.

Speakers at the morning session held on Feb. 15 included Sheldon V. Wood, Minneapolis Electric Steel Castings Co., Minneapolis; C. W. Briggs, technical advisor of the society, and C. S. Ching, U. S. Rubber Products Co., New York. William J. Cameron, Ford Motor Co., Detroit, spoke at the noon luncheon which was followed by a technical session in the afternoon. Speakers at that session included A. L. Kress, National Metal Trades association, and J. A. Westover, Burnside Steel Castings Co., Chicago. Mr. Kress explained methods used in evaluating jobs and in rating employes. Mr. Westover discussed grinding wheels.

Wisconsin Meeting

(*Concluded from page* 63)

bility of a core may be increased by increasing the permeability, by decreasing the clay content of the core sand, and by reducing the amount of binder. Mr. Dietert pointed out that the strength of nonferrous castings is increased with an increase in the permeability of the sand in which the casting was poured. In cases where it has been found desirable to reduce the hot strength of the molding sand to avoid hot cracks in the casting, the speaker recommended reducing the green sand strength, reducing the moisture content, and increasing the permeability. Use of sands having a low strength also was cited as a remedy.

The last nonferrous session Friday afternoon was presided over by H. F. Goodwin, Aluminum Co. of America, Milwaukee. Introduction to and comment on a talkie film *Mine To Metal and Aluminum Fabricating Processes* was presented by W. E. Sicha, member of the technical staff, Aluminum Co. of America, Cleveland.

A joint meeting of the conference on Thursday afternoon heard Dean Franz A. Kartak, college of engineering, Marquette university, Milwaukee, present an interesting and most instructive talk on "Training Tomorrow's Foundrymen." William J. MacNeill, Federal Malleable Co., West Allis, Wis., and president of the Wisconsin chapter, presided.

Outlines Training Course

Dean Kartak stated, any industrial organization must have three elements, namely, management, machines and men. He then drew an interesting analogy between a theoretical condition where all machines used by the industry rented from a central pool, and the human factors of industry.

The speaker pointed out that different employes have different achievement ceilings just as each airplane has a height to which it may fly. He indicated three divisions as follows: 1—Operator, requiring the least background and training period, but having the lowest achievement ceiling; 2—Trade apprentices, trained men or boys who may have the opportunity of advancing to foremanship, requires more natural ability and have a higher achievement ceiling; 3—Technical control employes made up of engineers, metallurgists, chemists, and having a still higher achievement ceiling. From the latter group may come the key men of the organization. The speaker stressed the increasing need for college graduates in the foundry industry.

CLEANBLAST

SHOT and GRIT

"Cleanblast" alloys are patented.

Cleanblast Shot and Grit are proven quality products made in many grades to satisfy your needs:

Shot produced in 20 sizes.
Grit produced in 14 sizes.

"Cleanblast Alloy 99" is a super blasting shot.

Our engineers will gladly review your blast cleaning operations and make recommendations for further economies.

ALLOY METAL ABRASIVE COMPANY
311 W. HURON STREET — ANN ARBOR, MICH.

HOT-WEATHER PROTECTION
IDEALLY ADAPTED TO FOUNDRY REQUIREMENTS!

M. S. A. SALT TABLETS

M.S.A. *Dustproof* SALT TABLET DISPENSERS

Summer heat conditions and sweating men raise the problem of "heat sickness" and lost production-time in many a modern foundry . . . a problem that is more easily controlled by the use of M.S.A. Salt Tablets!

These quick-acting tablets replace the body-salt lost in excessive perspiration, help prevent cramps and other distress due to saline unbalance. They are made of sodium chloride or with added dextrose, if desired.

M.S.A. *Dustproof* Salt Tablet Dispensers, with one-piece bodies of molded bakelite, provide one tablet at a time—*every time*—directly in palm of the operating hand. Dust, dirt or grit cannot enter; they are weatherproof and can be installed anywhere. Write for the complete details—*now*, before the need is acute. Ask for Bulletin FA-66.

Be sure to visit our Exhibit at the Foundry Show!

● M. S. A. Salt Tablets, supplied in moisture-proof cartons of 500 or 1500.

● M. S. A. "350" Salt Tablet Dispenser—black or red bakelite, as specified.

● M. S. A. "1500" Salt Tablet Dispenser, with transparent window for easy checking of contents.

MINE SAFETY APPLIANCES COMPANY
BRADDOCK, THOMAS AND MEADE STREETS . . . PITTSBURGH, PENNA.
District Representatives in Principal Cities

FOUNDRY AND ARMY ORDNANCE

(*Continued from page 29*)

superior to that of a forging. Longitudinal ductility and strength are equivalent.

Our centrifugal castings are given high diffusion treatments which are responsible, in part, for the high ductility and uniform physical properties. There is some segregation of carbon and other elements at the bore of the castings. This is relieved, in part, by the high temperature diffusion treatment. The higher tensile properties of the bore are beneficial so far as the strength of the gun is concerned. Effect upon erosion has not been determined.

Knowing the dimensions of the desired cannon casting and the chemical composition of the alloy steel which is to be used, the steel melter determines weights of various items of melting stock that will make up the furnace charge. When the heat is ready, the molten steel is poured into a special runner box which carries a spout that will direct the molten metal into the opening in the chill mold. This chill mold is a special shaped casting, the outside of which fits into the casting machine but the inside is bored out to approximately the desired shape of the exterior surface of the cannon to be cast.

Cast Steel Cannon

Whether or not the same design of mold may be used for different designs of guns or lines depends largely upon the diameter desired at the breech end, as the muzzle end may be stopped off to give any length wanted. For small peace-time orders it is cheaper to machine off some extra metal than to provide special molds. On large production orders it would be economical to make a special mold and thus avoid unnecessary machining. The mold is mounted for rotation in a machine with its axis horizontal.

The pouring of the whole heat varies but it must be accomplished quickly to avoid freezing of the steel before the mold is filled properly. Rate of filling the mold is controlled by the diameter of the hole through the spout and the height of head of molten metal in the runner box. Speed is maintained on the mold long enough to insure complete solidification. The casting is removed from the chill mold as soon as it is solid and rigid enough to keep its shape during handling. When removed from the chill mold, the hot casting is cooled slowly in cinders or in a furnace to obtain a more uniform crystalline structure of the metal. The purpose of controlled cooling of castings is to avoid flakes of internal bursts, local hard spots, and external cracks due to improper cooling. Grain refinement is secured in subsequent heat treatments.

Heat treatment is normalizing or normalizing and annealing. The first normalizing is the high temperature diffusion treatment and it employs higher temperature and longer time than forgings. The annealing, quenching and tempering treatments are similar to those for forgings. The second normalizing, if any, is similar to forging practice.

With an adequate supply of molten metal, experience shows that a single mold can turn out five 3-inch A.A. liner castings (1800 pounds) in an 8 hour day. Six or seven such castings have been made in a day but that is greater than can be expected with present equipment. These heat treated castings are in every way equal to a rough turned, bored and heat treated forging. From a metallurgical point of view, they have marked superiorities.

Casting Superior To Forging

The casting in a very few minutes may be made within one-half inch of the finished outside diameter of the gun and will be perfectly round. In length it need be no longer than the finished piece except to provide test material or for manufacturing operations. The hole through the center is straight and may be made to approximate any given size.

The superiority of the casting over a forging is definite and very marked. The centrifugal force forces all gas and impurities into the central hole and as a result the usable part of the casting has cleaner denser metal. This same force leaves stresses set up in the metal which have been sought after for years. The principal defect of a centrifugal casting is microporosity or lack of density which has been overcome in castings the size of the 3-inch A.A. liner. Centrifugally cast metal has not been developed completely for 3-inch single piece guns or pieces of greater wall thicknesses.

No fiber exists in the castings as in a forging. The fiber is due to the presence of nonmetallics which are drawn out during forging. In castings these nonmetallics are spherical and finely distributed. This accounts for lack of directional properties in castings. Such a condition cannot be obtained with a forging and is most desirable in a gun.

From a chemical standpoint, the element giving strength to steel is found to be greater in amount at the bore than at the exterior. This places the strongest metal at the bore where it is most needed. But segregation is not limited to strength imparting elements as sulphur and phosphorus are also segregated at the bore.

This centrifugal casting process appears to be adapted ideally to gun manufacture whether it be from economical, the technical or metallurgical standpoint. Some authorities consider this development the greatest contribution to the art of gun making since General Rodman first successfully cooled the bores of cast iron cannon while the iron was solidifying.

In the World war, when forged steel shell could not be produced fast enough to supply the needs of the troops at the front, the foundry industry was called upon to supply the shortage with semisteel shell. In another major emergency a similar shortage may be expected and the foundry industry probably will be called upon again. This time it probably will be asked to furnish alloy cast iron shell to very close tolerances in order to reduce the machining time and to give the greatest possible strength for charge of high explosive or of smoke. There is a definite place in our program for a cast iron smoke shell, if smoke is used extensively, as it was in the World war. Cast iron has certain characteristics which make it more desirable than steel for use with smoke filled shell.

Cast Steel Slugs for Shells

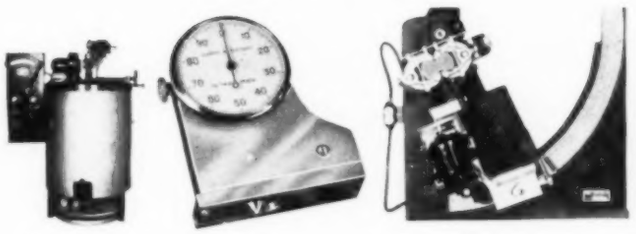
Cast steel slugs are authorized to be used in the manufacture of 8-inch shell and larger sizes of common steel shell. Some work has been done on centrifugally cast steel shell but there is need for a development program to perfect a casting technique which will secure the desired physical properties and satisfactory fragmentation.

Much of this discussion has been on the material that is produced in the foundry as it is related to national defense. There is one element, the human element, which will play an important part in the foundry industry in the next emergency. A few years ago we woke up to the fact that there is a decided shortage of skilled labor, even for a high level of peace-time operations. To provide the complicated products of the foundry needed to defend our country will surely tax the skill and the trained man power of the foundry.

With the foundry industry it is not possible to shift labor from

(*Concluded on page 100*)

CORE TEST



Core Test Oven — *Core Hardness* — *Tensile Core Strength*

Measure the properties of cores to improve core room operation and reduce costs.

SAND LABORATORY

Test Work Solicited

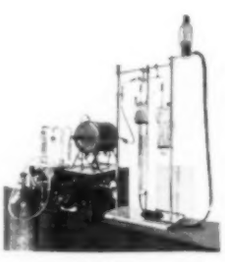
Molding Sands—Core Sands—Silica Sands
Core Oils—Core Binders—Bonding Clays.
Spectrographic Analysis.
A complete laboratory with a practical staff.

MOLTEN METAL TEMPERATURE

Ferrotemp

Accurate temperature determination of molten iron and nonferrous metal in ladles by immersion pyrometer. Range from room temperature to 3100° F.

Economical in cost and in use. Time required for reading is 50 seconds.



Carbon Determinator

MODERN ANALYSIS

Your laboratory needs modern analysis to make speedy returns. It pays to know what is happening today and not what happened yesterday.

Accurate carbon determinations made in two minutes with the Carbon Determinator.

Accurate sulphur determinations made in two minutes with the Sulphur Determinator.

Accurate spectrographic analysis of metals in eight minutes and less.

Write to us for

SAND TESTING — FERROTEMP — SPECTROGRAPH
QUICK CARBON DETERMINATOR — QUICK SULPHUR DETERMINATOR

HARRY W. DIETERT CO.
9330A Roselawn Ave.
DETROIT, MICH.

NAME and ADDRESS WANTED

If the foundryman who does not know all the advantages of using Smooth-On No. 4 will communicate with us, using the coupon below, he will learn something to his advantage

EXPERIENCED old timers as well as newly promoted or ambitious younger men can reply profitably. Not only has Smooth-On No. 4 been the standard material for 45 years for filling surface pits on castings and building up correct contour at the surface defects, but recent composition improvements for easier application, greater holding power and better match of surface color and texture have greatly expanded the field of usefulness.

A thorough knowledge of the working principles and application of Smooth-On No. 4 wherever its use is indicated can be a life saver in reclaiming many otherwise perfect castings, and effecting sale at top-notch price, of pieces that would otherwise require rejection.

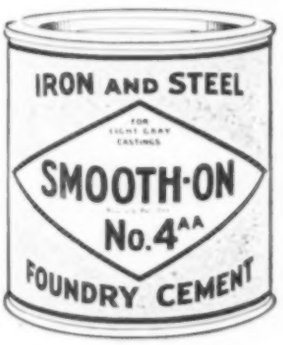
Three compositions, each with distinct color, degree of lustre and fineness of grain offer a choice for perfect match in iron and steel castings of any shade, appearance and quality.

Smooth-On No. 4AA. For light gray castings and machined surfaces. Has high metallic lustre and takes a fine machine finish

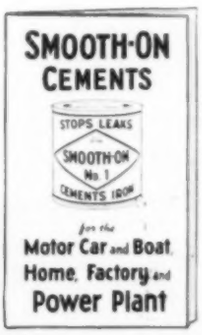
Smooth-On No. 4A. For medium gray castings. A fine-grained cement that has a good metallic lustre

Smooth-On No. 4B. For dark gray castings. A cement of coarser grain and darker shade

Make a critical test, and you will find your filling problems well solved.



Smooth-On No. 4AA is sold in 1-lb. can, 10-lb. and 50-lb. keg. Smooth-On Nos. 4A and 4B are packed in 1-lb. and 5-lb. can, 25-lb. and 100-lb. keg Mail coupon for prices and free hardened samples.



Smooth-On Mfg. Co., Dept. 17,
570 Communipaw Ave., Jersey City, N.J.

Send Smooth-On Handbook.
Send ..... Smooth-On Smooth-On Smooth-On samples of ☐ No. 4AA ☐ No. 4A ☐ No. 4B

Name .....

Address .....

4-40

Do it with SMOOTH-ON

(*Concluded from page* 98)

other fields as there are no similar industries and no common pool from which labor can be drawn. It requires from 3 to 5 years to train first class molders and even if that training were speeded up a war might be lost by the time their training was completed. That training should not be postponed until an emergency is upon us. Much has been said on the subject of apprentice training and your industry has made considerable progress.

As a result of experience the last 3 years at Rock Island Arsenal we have found the installation and operation of an adequate apprentice training plan neither difficult nor expensive. It has paid dividends already. As a result of a competitive examination given to 600 boys 3 years ago, 35 boys were selected for training as apprentices. We provided space, equipment and a competent instructor for the class. The local school authorities furnish an instructor for classroom instruction in shop mathematics, drawing, etc., and the apprentices take a nationally known correspondence school course which the boys pay for themselves at a reduced group rate. Today all 35 of those young men have completed 3 years of their apprenticeship and they are taking their places in the shop and getting experience on various machines and types of work. Our foremen all are agreed that these 3 year apprentices are better than the average machinist we are able to employ at the present time. Many of them are desirous of taking a fifth year of training to become toolmakers.

Select Boys from Large Group

A year ago we took on 15 additional apprentices from the 1936 examination. This month we have taken on 25 more apprentices as a result of an examination last fall which was taken by 1200 boys who wanted to become apprentices. Twenty boys had a perfect mark in their examination. The boys selected were taken from the top of the list after personal interviews.

Our experience with apprentice training has been most gratifying, not only from the benefits we have gained, but from the satisfaction we have in training young men to take their place in industry and in rendering them capable of meeting the complicated tasks they will have to face to produce the modern engines of war. I am sure that those who have supported similar apprentice training plans will agree. I am sure that those who do not have such plans will also be amply repaid if similar plans are inaugurated.

Allow me to suggest that the foundry industry prepare to meet demands of national defense by replacing old and obsolete equipment and by adding such new equipment as x-ray machines, heat treating and annealing equipment, high speed and high precision cleaning and finishing machines. Laboratory facilities should be expanded and acid and basic electric furnaces rehabilitated to handle not only common carbon steel but the finest tool steel. This may sound fanciful and extravagant but it is a brief statement of the program that actually has been followed by a company which has been successful in supplying steel armor plate for combat tanks. If other foundries will follow the lead of that company some of the mistakes of the World war period can be avoided.

Book Review

Code of Recommended Good Practices for Metal Cleaning Sanitation, developed by A.F.A. industrial hygiene codes committee and approved by the board of directors as a code of recommended practices for the foundry industry; paper, 42 pages 8½ x 11 inches, with 5 additional pages of illustrations; published by the American Foundrymen's association and available for $2.50.

This is the fourth code in a series of recommended good practices compiled and issued by the American Foundrymen's association. The subject matter in this fourth code covers recommended practices and installations for alkaline, solvent, solvent degreasing, metal pickling, tumbling mili and abrasive blast cleaning processes; also pertinent information on metal cleaning generally for the prevention of accidents and minimizing exposure to occupational disease. So far as the committee has been able to determine, this is the first time definite engineering recommendations have been published dealing directly with hazards involved.

The section on solvent degreasing processes should be helpful to those considering the newer method of cleaning by chlorinated hydrocarbons. The abrasive blasting cleaning processes section is timely, applicable to old as well as new installations for exhaust and accident prevention requirements. All types of tumbling mills are included. An effort has been made to provide more adequate exhaust system requirements to carry the dust and dirt to the dust collection equipment. The code material can be used to advantage by those purchasing and installing new equipment or renovating old equipment and by vendors of equipment. It should afford essential information that might be included in industrial codes of regulatory bodies.

Material for the publication has been 2 years in preparation by members of the committee and by numerous conferees having special knowledge of the subject. Personnel of the committee is as follows: J. R. Allan, International Harvester Co., Chicago, chairman; E. O. Jones, American Foundrymen's association, Chicago, secretary; R. J. Aldrich (Deceased) Sloan Valve Co., Chicago; F. H. Amos, International Harvester Co., Chicago; E. E. Birkland, Crane Co., Chicago; C. P. Guion, W. W. Sly Mfg. Co., Chicago; Carl F. Larson, American Air Filter Co., Chicago; Nathan Lesser, Deere & Co., Moline, Ill.; John G. Liskow, Claude B. Schneible Co., Chicago; R. W. McCandlish, Research Corp., Chicago; S. McMullan, Western Electric Co., Chicago.

Conferees included: C. S. Anderson, Belle City Malleable Iron Co., Racine, Wis.; George Boesger, W. W. Sly Mfg. Co., Cleveland; W. K Clayton, Central Chemical division, Wilson & Co., Calumet, Ill.; O. L. Coffey, Whiting Corp., Harvey, Ill.; John W. Demmers, G. S. Blakeslee & Co., Cicero, Ill.; J. O. Houze, National Malleable & Steel Castings Co., Cicero, Ill.; George M. Howard, N. Ransohoff, Inc., Cincinnati; M. Marean, E. I. duPont de Nemours Co., Wilmington, Del.; T. R. McIlhinney, Shell Petroleum Corp., Chicago; O. T. Nelson, Wisconsin Industrial Commission, Madison, Wis.; Lamar Peregoy, Sivyer Steel Casting Co., Milwaukee; P. J. Potter, Pangborn Corp., Hagerstown, Md.; L. C. Stokes, department of labor, State of Illinois, Chicago; C. S. Tompkins, J. B. Ford Sales Co., Chicago; D. C. Turnbull, American Foundry Equipment Co., Mishawaka, Ind.; Ronald Webster, Hydro-Blast Corp., Chicago.

Publishes Index

American Society for Testing Materials, 260 South Broad street, Philadelphia, just has issued a 152-page booklet which comprises an index to all the society's standards and tentative standards, methods of testing, recommended practices, definition of terms, and charts and tables. Listing is by subject and by number so that location of any item is an easy matter.

Fifth annual forum of the Porcelain Enamel institute will be held at the University of Illinois, Urbana, Ill., Oct. 16 to 18, 1940, as announced recently by Frank E. Hodek Jr., General Porcelain Enameling & Mfg. Co., and chairman of the forum committee.

AMERICAN STEEL ABRASIVES
Can Take It! . . .

● Certainly, American Standardized Steel Shot and American Eversharp Steel Grit can take it, because they are manufactured to do your blast or centrifugal force cleaning job most economically.

"American" Steel Abrasives are skillfully and scientifically heat treated by a rigidly controlled heat treating method that assures uniformity in every grain of material. This rigid heat treatment reflects in a great amount of cleaning accomplished per pound of steel abrasive used.

If your cleaning room is not among the hundreds that is using "American" it would pay you to write for further information.

"The Steel Abrasive that is Heat Treated"

THE AMERICAN STEEL ABRASIVES COMPANY
GALION OHIO

Makes cores true to size

ROSS CORE DRAWER
MAKES
Better Cores Faster

●

Draw your cores as you draw your patterns with the aid of vibrators. Eliminates rapping expensive core box equipment. Designed for Jobbing or Production.

●

Send for Full Descriptive Pamphlet

THE FREEMAN SUPPLY COMPANY
Pattern Shop & Foundry Supplies & Equipment—Mahogany and Pine Pattern Lumber
1152 EAST BROADWAY **TOLEDO, OHIO**

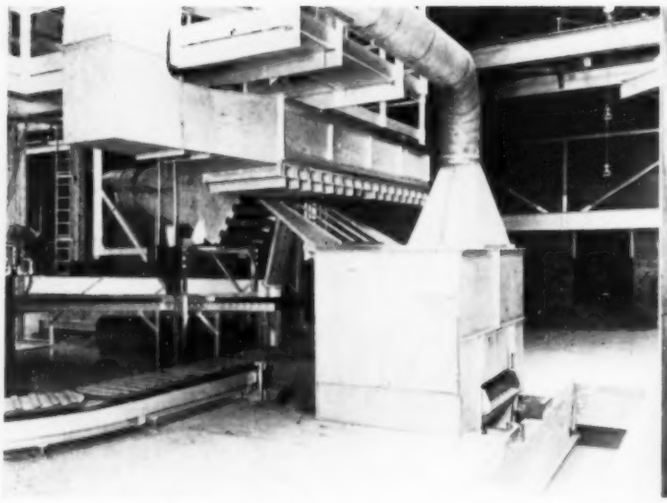


Fig. 36 (Left)—Casting shakeout on intermediate unit. Pit at right holds baskets which receive castings and are hung on cooling chain. Fig. 37 (Right)—Merry-go-round for cupola charges

NEW FOUNDRY BUILDS TRUCK ENGINES

(*Continued from page* 37)

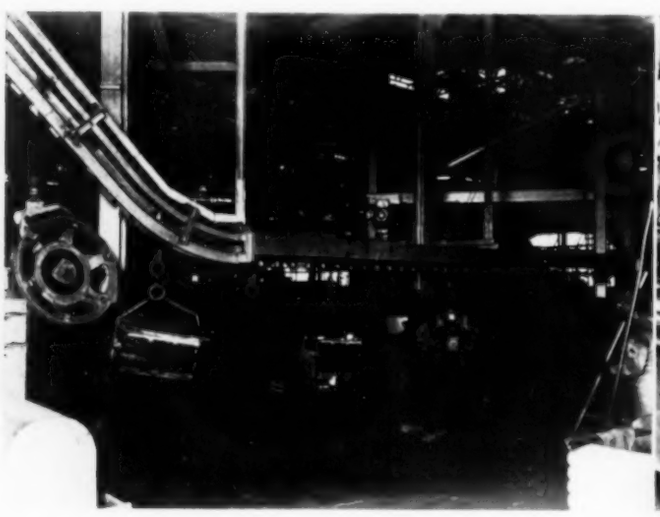
picked up by the small hoist shown in Fig. 33, operating on a steel I-beam.

Flow of materials in the foundry constantly is toward the south end where a large space is devoted to cleaning chipping and grinding the castings before they are shipped to the machining and assembling department. A covered passageway connects the foundry and machine shop and houses an overhead conveyor to which the larger castings are attached by hooks. This type conveyor also is used extensively in the foundry for carrying the larger castings, cylinder blocks, cylinder heads and wheels on a cooling trip after they are shaken out, also for carrying them through a cleaning cabinet where they are subjected to the action of a stream of metal abrasive thrown against them by centrifugal force from a rapidly revolving wheel.

A wide range of miscellaneous small castings pours continuously through the shakeout units at the end of each conveyor unit. Sand falls through a grating and is returned to the main sand system. The castings tumble down the sliding screen and into a steel bucket set in a pit for that purpose. Periodically the loaded bucket is lifted by a hook attached to the chain conveyor and replaced by an empty bucket. The loaded buckets travel a certain distance for cooling purpose and then the loads are discharged into various pieces of cleaning equipment including three airless blast cleaning machines and eight tumbling barrels. After leaving these devices the castings are ground or chipped where necessary, given a final inspection and shipped to the machine shop.

Each of the shakeout units is provided with a hood terminating in a large pipe connected to an air exhaust system which removes smoke, gas, steam and dust. A fan with suitable pipe and outlet discharges a constant volume of air into the front of the shakeout hood. One of the shakeout units is shown in Fig. 36 with the blowing device shown at the left center. As each mold on the conveyor arrives opposite the shakeout it is engaged by a pneumatically operated pusher which shoves it from the conveyor and on to the sloping, vibrating screen under the hood. The pusher is essentially the same as a plain pneumatic hoist mounted horizontally in-

(*Concluded on page* 104)



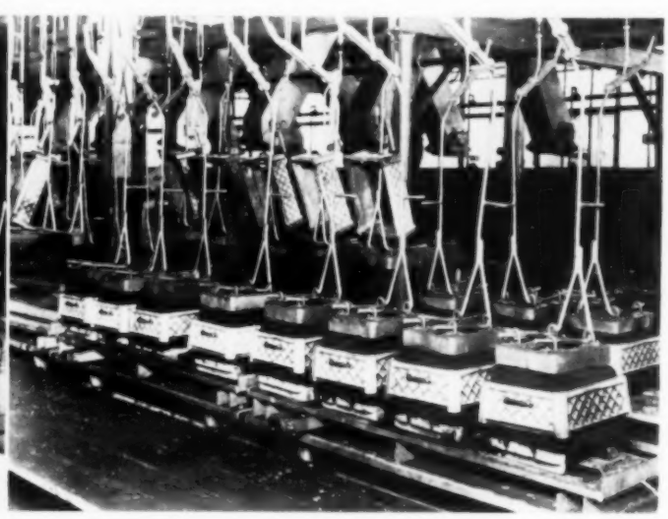


Fig. 38 (Left)—Castings leaving shakeout on large unit on cooling chains preparatory to core knock-out. Fig. 39 (Right)—Close-up showing weight lifting and lowering device

See the Show

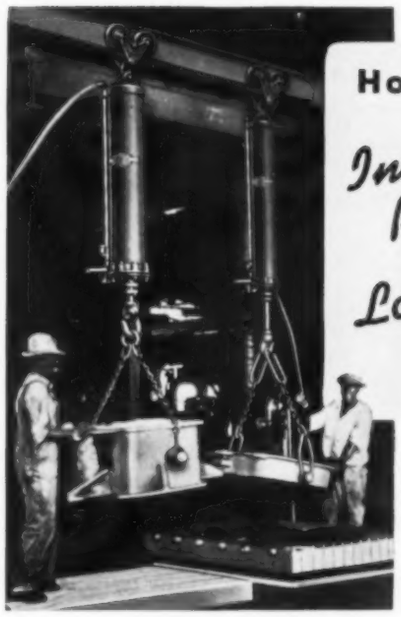
in Chicago, May 4th to 10th, and become acquainted with the latest advances in foundry methods and equipment.

We extend to you a cordial invitation to visit our display of Molding Machines, Flask Equipment and accessories in Spaces 496 and 497.

The Adams Company

1883—Our 57th Year—1940

800 Foster St., Dubuque, Iowa



How You Can

Increase Production, Lower Costs

!

with

CURTIS
Air Hoists

● In hundreds of industries throughout the country material handling costs are being greatly reduced through the use of Curtis Air Hoists.

Curtis All Steel Air Hoists are smooth, speedy and efficient; accuracy of control is assured, and they will handle the most delicate hoisting and lowering operations. Any workman can operate and maintain their simple mechanism. For a given capacity, their dead weight is much less than that of other power hoists, permitting lighter supports, as well as easier moving of trolley mounted loaded hoists. Pendant, bracketed and rope compounded types.

Undesirable atmospheric conditions, steam, fumes or dust have no effect on Curtis Air Hoists. They're built for years of continuous, trouble-free service and cannot be damaged by overloading.

There are doubtless many places in your plant where production can be speeded up and costs can be lowered with Curtis Air Hoists. You can make a quick survey by using our handy booklet "How Air is Being Used in Your Industry" — send the coupon for it now.

CURTIS ST. LOUIS, NEW YORK, CHICAGO, SAN FRANCISCO, PORTLAND

Curtis Pneumatic Machinery Co.
1922 Kienlen Avenue, St. Louis, Missouri

Please send me your free booklet "How Air is Being Used in Your Industry" and further details concerning Curtis Air Hoists.

Name .....
Firm .....
Address ..... State .....
City .....

(*Concluded from page* 102)
stead of vertically. Air admitted at either end of the long cylinder drives the piston and piston rod either backward or forward as desired.

A general view of the raw material storage yard is shown in Fig. 29, with large bins for coke, limestone and pig iron at the right close to the railroad track, concentrated bins for cupola charge makeup at the left and bulk scrap storage in the background. Bulk material is handled by a 10-ton crane mounted on a runway 100 feet wide and equipped with either a clam shell bucket or a magnet. Cranes on the lower runway as shown in Fig. 30 pick up the pig iron and scrap from the bins and carry this material to the makeup floor where it is arranged in proper proportion and then dropped through an opening in the floor shown in Fig. 28. The iron falls into a steel bucket mounted on a circular conveyor.

Coke and limestone are stored in a joint hopper with chutes at the bottom converging to a point where a definite amount of each material flows through a gate into a steel bucket somewhat smaller than the bucket which carries the pig iron and scrap. The buckets are mounted on small buggies spaced about 6 feet apart. By suitable control apparatus the buckets are moved forward in rotation and spotted accurately to receive their respective loads. In regular order each car arrives at a point in the cupola building where the bucket is picked up by a hook suspended from a charging machine, lifted to the proper height and inserted in the cupola where the bottom of the bucket is released and the charge dropped into the cupola. The empty bucket then is returned to the buggy on the ground floor conveyor and released as shown in Fig. 31. The operator shown at the right of this illustration controls and directs all cupola charging activities from this ground floor station. A scale on the makeup floor regulates the weight of the iron charges. A scale on the ground floor, shown in Fig. 37 automatically weighs the correct amount of coke and limestone for each charge. After the metal is melted it is tapped into a covered, insulated holding ladle, which in turn delivers metal to the drum type ladles suspended from a monorail system extending to the various pouring stations.

A maintenance department with skilled personnel and adequate equipment takes care of repairs and replacements in the foundry. Part of the mobile equipment, a portable pipe threading machine and a portable combined tool box and work table are shown in Fig. 34.

This is the concluding article in a series of three dealing with many of the general and detail features of a gray iron foundry recently placed in operation in Indianapolis, by the International Harvester Co. The first article appeared in the January, and the second in the March issues of THE FOUNDRY.

THE EDITORS.

Scrap Puts Molder In Dog House

A novel method of reducing scrap losses recently has been put in operation by the General Foundry & Manufacturing Co., Flint, Mich., according to the Meehanite Research Institute. It is claimed the system has given definite proof of effectiveness by reducing scrap losses and stimulating interest on the part of the workmen in raising the standards of their output.

The device, shown in the accompanying illustration, is a large blackboard on which the molders' names are listed according to number, and ruled for a week's record. Two dog houses are shown at the left, one for each day and one for a weekly record. Molders whose scrap exceeds a predetermined percentage are placed in the dog house, to their chagrin and to the amusement of their fellows. Men whose scrap losses remain in the lower brackets compete for a monthly prize of $30 divided among the six with the lowest percentage. Red, white and blue squares after each man's number indicate his percentage classification. The system is based on the universal human desire to excel and to avoid ridicule. In this instance it has improved employe relationships and increased shop profits through a reduction in scrap loss.

Scrap exceeding a definite amount places molder's name in dog house

Book Review

A.S.T.M. Standards 1939. Part I Metal, 1308 pages, 6 x 9 inches, published by the American Society for Testing Materials, 260 South Broad Street, Philadelphia, $8.00.

This volume is part I of a series of three constituting the 1939 book of A.S.T.M. standards, and relates only to metals. It has been extensively revised and amplified, and contains both standard specifications and tentative specifications and tests. The volume contains 300 specifications, tests, and definitions of which 180 are devoted to ferrous metals, 105 to nonferrous metals and alloys, and 15 applying to both.

The specifications, definitions and methods of test presented in the book are used as standards for engineering materials because they are competent, unbiased, widely applicable and authoritative. They are based on best commercial practices, and adequate scientific research, and on sound engineering judgment. Each standard is formulated and recommended by a standing committee composed of well informed technologists on the subject in question.

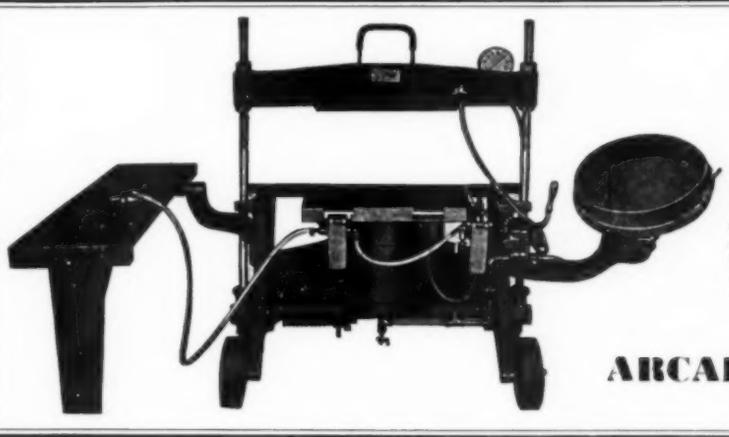
The new edition incorporates many features including double column format, improved editorial style, amplified subject indexes, and two tables of contents; one by subject, and the other by serial designations of standards. The new double column format makes the book much easier to read, and the whole volume is an excellent example of the art of printing.

Bureau of Mines, Washington, recently has published the annual report of the metallurgical division for 1939. In mimeograph form, the report contains 98 pages and gives progress reports on various activities. It is divided into 9 principal divisions relating to metallurgical fundamentals, special studies, electrometallurgical, ore dressing, nonferrous metallurgy, precious metals, metallurgy of copper, blast furnace studies, and metallurgy of steel.

STEEL GRIT ECONOMY STEEL SHOT

A
100 LB. BAG
of
"CERTIFIED" STEEL
ABRASIVE
is
more valuable than gold to a metal-cleaning shop. Use it in your airless and air blast cleaning machines. It is long lasting, efficient and a hard worker. A size for every need. Known everywhere for its
ECONOMY and CLEANLINESS

PITTSBURGH CRUSHED STEEL CO.
PITTSBURGH, PENNA.
STEEL SHOT AND GRIT CO.
BOSTON MASS



DEPENDABLE
JOLT SQUEEZERS

	No. 81	No. 91	No. 101
Jolt Cyl.	3"	4"	5"
Squeeze Cyl.	8½"	10"	13"
Between Uprights	32"	36"	38"

ARCADE MANUFACTURING CO.
Freeport, Illinois

GOOSE LAKE
Illinois Clay Products Company
Fire Clay and
Fire Clay Flour
Fire Clay Brick
Therm-O-Flake Insulation
JOLIET, ILL.

FOUNDRY ACTIVITIES

META-MOLD ALUMINUM CO., Milwaukee, recently purchased a building in Cedarburg, Wis., near Milwaukee. The new factory building has 15,000 square feet of floor space for manufacturing. The company reports that all available space at the Milwaukee location is in use, and due to increased business of the company, expansion was necessary. Peter J. Watry is president and Nicholas J. Watry, vice president.

* * *

George E. Dilley & Son, Palestine, Tex., has been dissolved. The company formed 65 years ago furnished gray iron castings to the International and Great Northern railroad.

* * *

K. & C. Brass & Aluminum Casting Co., Lansing, Mich., has been organized by John Kobus and Andrew Ciepiela for manufacture of nonferrous castings.

* * *

Service Brass Corp., 2901 East Slauson avenue, Los Angeles, is preparing plans for additions to its office and factory and to enlarge the foundry and machine shop.

* * *

Menasco Mfg. Co., Los Angeles, recently has installed equipment to produce castings by the Antioch process. A. E. Shelton is president of the company.

* * *

Meehanite Metal Co. (South Africa) (Pty.) Ltd., Johannesburg, subsidiary of Meehanite Metal Corp., Pittsburgh, has licensed J. Begbie & Co., Middleburg, Transvaal, South Africa, to manufacture meehanite castings.

* * *

Whiting Corp., Harvey, Ill., has operated a full year, ending Feb. 21, without a single lost-time accident, a total of 1,426,697 man-hours as compared with the average of similar plants of 45 lost-time accidents per year, according to figures of the United States department of labor.

* * *

Mork Foundries, Inc., 132 Blackhawk boulevard, South Beloit, Ill., recently has been organized to operate a gray iron foundry. It will occupy buildings formerly used by the P. F. Mork Foundry and the Slater & Tuck Foundry. Officers of the corporation are F. H. Mork, president and H. C. Mork, treasurer.

* * *

S. J. Gardner Foundry & Machine Co., New Albany, Ind., recently purchased the Hegewald Foundry property, State and Water streets, New Albany. Purchase included equipment, machinery, tools and patterns in the plant. There are no immediate plans for operation or use of the property.

* * *

Electric Steel Foundry, 2141 Northwest Twenty-fifth avenue, Portland, Ore., recently played host to the local chapter of the American Society for Metals. The evening included dinner at the plant, a trip through the new chemical and physical testing laboratories and the main foundry. E. G. Swigert, vice president of the company spoke on "Steel Foundry Practice."

* * *

A foundry employing 600 men is to be built at Tijuana, Mexico, just across the border from California by several Spanish industrialists, exiled by the present government in Spain. They are negotiating with the Mexican government for permission to proceed with the project. If permission is granted, the foundry will hire refugees from Spain.

* * *

Atlas Foundry Co., Detroit, recently celebrated its thirtieth anniversary. Robert Crawford, pioneer Michigan foundryman who died in 1931, founded the company in February, 1910. The organization is being operated now under the management of his three sons; W. B. Crawford is president and treasurer, R. B. Crawford, vice president and general manager, A. R. Crawford, vice president.

* * *

Index of foundry equipment orders for February, according to a report of the Foundry Equipment Manufacturers' association, Cleveland, was 179.4 as compared with 197.9 in January and 135.3 in February, 1939. Index of shipments was 184.2 as compared with 193.2 in January and 112.2 in February, 1939.

* * *

RAW MATERIAL PRICES
March 19, 1940

Iron	
No. 2 foundry, Valley	$23.00
No. 2 Southern Birmingham	19.00
No. 2 foundry, Chicago	23.00
No. 2 foundry, Buffalo	23.00
Basic, Buffalo	22.00
Basic, Valley	22.50
Malleable, Chicago	23.00
Malleable, Buffalo	23.50
Charcoal iron, furnace	27.00
Coke	
Connellsville beehive premium	$5.75 to $6.30
Wise county beehive coke	5.50 to 6.50
Detroit by-product delivered	11.00
Scrap	
Heavy melting steel, Valley, No. 2	$15.50 to $16.00
Heavy melting steel, Pittsburgh, No. 2	16.00 to 16.50
Heavy melting steel, Chicago, Auto No. 2	12.50 to 13.00
Stove plate, Buffalo	13.50 to 14.00
Stove plate, Chicago	8.50 to 9.00
No. 1 cast, mchy., New York	14.50 to 15.00
No. 1 cast, mchy., Chicago	14.50 to 15.00
No. 1 cast, Pittsburgh	17.50 to 18.00
No. 1 cast, Philadelphia	19.50 to 20.00
No. 1 cast, Birmingham	16.00 to 16.50
Car wheels, iron, Pittsburgh	18.50 to 19.00
Car wheels, iron, Chicago	17.00 to 17.50
Railroad malleable, Chicago	18.50 to 19.00
Malleable, Buffalo	17.00 to 17.50
Nonferrous Metals	**Cents per pound**
Castings copper, refinery	11.25
Straits tin	46.50
Aluminum, 99 per cent	20.00
Aluminum, No. 12 (Secondary, standard)	14.50 to 14.75
Lead, New York	5.25
Antimony, New York	14.00
Nickel, electro	35.00
Zinc, East St. Louis, Ill	5.75

Foundry Groups

(*Concluded from page 79*)

of "Doodlebugs" which he operated and described. This was not strictly a foundry topic but the speaker warned the foundrymen that they looked just as much like *suckers* as other groups he had addressed.—*O. W. Potter, secretary.*

Reading

READING Foundrymen's association held its regular monthly meeting at the Wyomissing club, Reading, Pa., on Feb. 20 with President E. J. Snell presiding. Over 60 members were present to hear a talk presented by J. L. Sweeney, foundry superintendent, Florence Pipe Foundry & Machine Co., Florence, N. J., on "Good Housekeeping in the Foundry." His talk was illustrated with slides and motion pictures showing in detail the appearance of various foundry departments before and after good housekeeping began.

Mr. Sweeney outlined the system used in his plant whereby a demerit system is used for each department—departments being represented on a chart as race horses on a track, and each department striving for the best record to come into the home stretch, a winner. He declared that every man in the shop should know how much a shovel and a molding brush cost, and that a new firebrick used to block up a wheelbarrow costs the firm 5 cents. The talk illustrated that orderliness and system can be instilled into the minds of employes in any plant, if properly approached, and that the resultant good housekeeping in the foundry will pay big dividends to both employer and employe.—*H. C. Cummings, secretary.*